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EXPERIMENT STATION RECORD

VOL. 82 JANUARY, 1940 No. 1

THE FIFTY-THIRD CONVENTION OF THE ASSOCIATION OF LAND-GRANT COLLEGES AND UNIVERSITIES

The convention held from November 15 to 17, 1939, was the fifty-third in the annals of the Association of Land-Grant Colleges and Universities and its twenty-sixth to meet in Washington, D. C. Long ago these gatherings became accepted fixtures in the routine of the Nation's Capital, nearly as certain of appearance in each alternate November and as outwardly standardized as its Community Chest campaign and its Thanksgiving turkey.

However, regardless of superficial resemblances, the 1939 convention was by no means "just another Washington meeting." On the contrary its individuality was apparent in a dynamic spirit which translated its usual progressiveness of outlook into an alertness and an initiative to which the term "militant" might seem appropriate. This attitude found concrete expression at several points, notably the decision, after many years of discussion, to authorize the appointment of a full-time secretary to attend to and safeguard its interests more effectively, and the recommendation by the subsection of experiment station work of more frequent meetings and greater activity of the committee on experiment station organization and policy. Perhaps it was even more potent as a more or less intangible force and vigor stimulating and activating the association in its position on current issues and its relations with other agencies.

The extent to which this change of attitude reflects new leadership would be an interesting speculation. Perhaps at no period has the turnover in membership been more extensive than in the past 3 years, with new experiment station directors at the helm in 20 of the 48 States and new presidents in 16. Certainly in most of the convention groups the proportion of newcomers was noticeable and their influence considerable.

The total attendance approximated at least 500. All States were represented, in many cases by complete delegations of executive heads, deans, and directors of agriculture, engineering, and home economics. Interest in the general sessions was well sustained, reaching its climax as expressed by attendance on the final day

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when the speakers were Mrs. Franklin D. Roosevelt and Secretary of Agriculture Henry A. Wallace.

The make-up of the convention program was considerably influenced by an amendment to the constitution adopted in 1938 advancing the time for the submission to the executive committee of reports of committees and recommendations of sections and divisions. One result of this change was the formal scheduling of a day or more of preconvention sessions for the sections of engineering and home economics and the subsections of experiment station work and extension. Where this was done some unevenness was discernible in the fullness of session programs, but considerable additional time was made available for many of the group discussions, and presumably the business of the executive body, which as usual was conducted behind closed doors, was appreciably expedited.

The president of the association, President Julian A. Burruss of the Virginia A. and M. College and Polytechnic Institute, took as his theme Achievements and Opportunities. He pointed out that the colleges of agriculture and mechanic arts, a group peculiar to the United States, were a great experiment. "Believing that the subjects underlying agriculture and the mechanic arts were proper fields of study, that they could be used as means for the enrichment of the human mind, for the cultivation of the human heart, for the expansion of a great industry, for the development of good citizenship, for the maintenance of a free country, the colleges accepted the challenge. After three-fourths of a century there is convincing evidence that these colleges have made a very genuine contribution to the development of our country in things material, intellectual, educational, moral, and spiritual. The alumni of these institutions constitute one of the finest assets of both State and Nation."

Notwithstanding "achievements of inestimable value for the welfare of our people and the safety and progress of our Nation," President Burruss maintained that there still remain "innumerable opportunities for further and greater achievement." He decried a "tendency to permit specialized technical courses to crowd out liberal subjects, even modern ones such as English and the social and economic sciences," as well as too great absorption by schools of agriculture, home economics, and engineering in increasing productive efficiency. "In the zeal for specialization it should not be overlooked that our highest objective is to take various imponderable elements as well as ponderable elements of the educational process and weld them in such proportions as will produce men and women of greater power, of increased efficiency in serviceable vocations, of never-failing patriotism and loyalty to the commonweal, of kindliness and liberal-

mindedness, in short, the finest type of manhood and womanhood. This is the supreme task, the supreme opportunity, the supreme achievement, of the college, as it is of human life itself."

Following President Burruss, a message of optimism as to the future of America, coupled with a plea for higher living standards, was brought by Dr. Allen A. Stockdale, well known as a clergyman and lecturer and now with the National Association of Manufacturers. Taking as his subject Foundations of American Life, Dr. Stockdale found the underlying strength of the Nation to lie in its democratic ideals of free speech and individual security and initiative. Among the essentials for the preservation of these blessings and the diffusion of advantages still available only to a minority, he emphasized the necessity of larger expenditures for education and enlightenment.

One of the unique features for which the convention seems likely to be long remembered was its extended contacts with Mrs. Roosevelt. These included her participation as guest speaker at the dinner of the section of home economics as well as her address at the final general session of the entire convention. On the latter occasion she discussed The American Home and Present Conditions, emphasizing the need of a fuller understanding between rural and urban people. Consumers in particular, she averred, need information as to the reasonableness of prices, especially in times of emergency, and she visualized the opportunity for leadership by the land-grant institutions in contributing to closer relationships with producers and related groups.

The address of Secretary Wallace was entitled Conservation—the Farmers' Part in National Defense. Referring to the need for a new look at an old problem, he declared that "because purely individual action has failed to protect our resources, the cooperation of local, State, and Federal governments and the expenditure of public funds for this purpose have become indispensable."

He reviewed and commended the substantial progress made in recent years, but declared that "land is still wearing out faster than we are able to restore it." He deemed it "possible and wholly desirable to reorient all agricultural programs more firmly and more definitely toward the common objective," and stated that "within a few weeks we shall announce specific changes in the agricultural adjustment, conservation, rehabilitation, and related programs that will concentrate our effort still more truly on the conservation of land resources." He emphasized, however, that "administrative changes in programs and efforts for greater coordination of programs will come to little unless they are in harmony with and in

response to the informed convictions of farmers. That is why the community, county, and State land-use planning work is the very heart of a national conservation effort."

"The truth is," he concluded, "that this Nation's need is for a master conservation plan—a plan to save our natural resources that is conceived with realism and prosecuted with patriotic fervor; and a plan to restore human resources as an expression of a country's concern over the people who live in it."

In addition to the address of the Secretary, the Federal Department of Agriculture was generously represented on the program by other staff members. Under Secretary M. L. Wilson opened a discussion in the single session of the section of agriculture on State-Federal Relationships Affecting Agricultural Programs and a symposium in the extension subsection on The Place of Extension Service in the New Department of Agriculture. Director M. S. Eisenhower, Coordinator of Land-Use Planning, outlined in the experiment station subsection The Administrative Necessity for Land-Use Planning, and Director of Extension C. W. Warburton, Dr. H. R. Tolley, Chief of the Bureau of Agricultural Economics, and others took up various aspects of land-use planning before other groups. Drs. C. E. Kellogg of the Bureau of Plant Industry and A. L. Patrick of the Soil Conservation Service discussed The National Soil Survey. Dr. J. T. Jardine, Director of Research and Chief of the Office of Experiment Stations, participated in the discussion of Important Current Problems in the Administration of Agricultural Research, and Mr. R. W. Trullinger, Assistant Chief of the same Office, in that on The Experiment Station and Industrial Service. In the resident teaching subsection a panel discussion of Training for Public Service in the Field of Agriculture was led by Dr. A. F. Woods, Director of the Graduate School, and participated in by Dr. Eugene C. Auchter, Mr. Reuben Brigham, and Mr. Trullinger, as well as by Governor F. F. Hill of the Farm Credit Administration. Still other Department representatives on the program were Miss Sybil L. Smith of the Office of Experiment Stations in the section of home economics and J. L. Boatman of the Extension Service, the latter in a discussion of The Specialist in a Coordinated Program of Agriculture.

Another Federal activity for a discussion of which provision was made in the general sessions was the National Youth Administration. Director Aubrey Williams of this agency reviewed its 5-year history, revealing that $75,000,000 is now being expended annually for student aid in about 1,600 schools, colleges, and universities, and that the total number of students aided per year is about 125,000. The

value of this work is now being reappraised from the standpoint of existing conditions, and he bespoke the assistance of the land-grant institutions in the formulation of a future policy.

Special mention should be made of an extended discussion of the relationships between agricultural production and business activity presented by Dr. Louis H. Bean, economic adviser of the Agricultural Adjustment Administration. Dr. Bean saw little reason for belief that any industrial stimulation through war orders would bring any appreciable improvement in the agricultural export situation, since for several years Europe has been declining in importance as a market for both American agricultural products and manufactures. Some more powerful influence on industrial recovery which would bring about fuller urban employment with increased consumer buying power and restore the balance between city and country was indicated as the outstanding need of the immediate future.

Unusual opportunities for contacts by the association with the viewpoint of industry were afforded by the addresses before the convention of Mr. Hector Lazo, executive vice president of the Cooperative Food Distributors of America, on Your Food Dollar; Miss Margaret Dana, merchandising counselor of New York City and Orange, Va., on Consumer Problems; and Dr. C. M. Stine, vice president of E. I. du Pont de Nemours and Company, on A Chemist Looks at Agriculture. Each of these brought an interpretation of some of the services which industry is rendering to American farm and home life. In addition there were also a number of papers by representatives of industry before the section of engineering.

In the main the programs of the sections and their subdivisions not already mentioned followed along accustomed lines. One of the new developments was the inauguration of the new section of graduate work, which held an afternoon session, a dinner meeting, and a joint meeting with the subsection of resident teaching. The program pertaining to research was considerably enlarged and extended. Following the usual custom, special consideration will be given to this matter in the February issue of the *Record.*

For the ensuing year President F. D. Farrell of Kansas was promoted from the vice-presidency to the presidency, with Dean W. C. Coffey of Minnesota becoming vice president and Dean T. P. Cooper of Kentucky continuing as secretary-treasurer. Extension Director T. B. Symons of Maryland succeeded President R. G. Bressler of Rhode Island on the executive commitee. A list of section officers, committee changes, and related information may be found on page 144 of this issue.

amount and nature of the fats produced in the mycelia, and the effects of the initial concentration of glucose, concentration of NH_4NO_3, acidity, alkalinity, temperature, increased aeration, and period of incubation upon the amount and nature of the fat produced by a single spore culture of *A. fischeri*.

The production of mycelia with high fat contents was favored by neutral or slightly alkaline media, a high initial concentration of glucose, and a low concentration of NH_4NO_3. The production of increased percentages of sterol in the mycelium was favored by a fairly high initial concentration of glucose, 1 percent NH_4NO_3 or an initially acid medium containing an equivalent amount of urea, a higher temperature (37°[C.]), and a long period of incubation. The production of increased percentages of phospholipin in the mycelium, as judged by the percentages of lipin phosphorus, was favored by a low initial concentration of glucose, 1 percent NH_4NO_3, and an initially slightly acid medium. During inanition the greater part of the fat (exclusive of unsaponifiable matter) was utilized by the mold. The iodine numbers of the fatty acids obtained from the total fat of the mold were higher when the mold was grown on a low concentration of glucose, on a medium which became strongly acid, or at a lower temperature. The neutral equivalents of these fatty acids were in all cases very near to 280.

The chemistry of mold tissue.—VII, The lipids of Penicillium aurantio-brunneum, E. H. Kroeker, F. M. Strong, and W. H. Peterson. (Univ. Wis.). (*Jour. Amer. Chem. Soc., 57 (1935), No. 2, pp. 354–356*).—The seventh paper of the above series notes that the simple lipides of *P. aurantio-brunneum* have been shown to consist essentially of glycerides of palmitic, stearic, oleic, and linoleic acids. Ergosterol was isolated from the unsaponifiable matter.

The chemistry of mold tissue, VIII, IX. (Univ. Wis.). (*Zentbl. Bakt. [etc.], 2. Abt., 92 (1935), No. 13–19, pp. 324–330, 330–338, fig. 1*).—These two papers continue the serial contribution above noted.

VIII. *Innate factors influencing growth and sterol production of Aspergillus fischeri*, P. R. Wenck, W. H. Peterson, and H. C. Greene.—Studies of the growth and sterol production of six strains of *A. fischeri* and eight single spore cultures from one strain of the same mold under identical conditions yielded the information that both growth and sterol production varied with the strain and with different single spore cultures. Maximum variations averaged 7.5 percent for growth and 14.9 percent for sterol production when single spore cultures were used as inoculum and 25.2 and 17.5 percent, respectively, when the parent culture was used.

IX. *Cultural factors influencing growth and sterol production of Aspergillus fischeri*, P. R. Wenck, W. H. Peterson, and E. B. Fred.—"With different carbon sources an inverse relationship between the quantity of mycelium produced and the percentage of sterol in the mycelium was noted. Increasing the glucose concentration in the medium increased the percentage of sterol. In media without calcium carbonate, urea was the best nitrogen source. In media with calcium carbonate, ammonium nitrate was the best nitrogen source. The percentage of sterol varied with the ratio of glucose and urea in the medium. A ratio of 40 : 1 gave the best results. The percentage of sterol increased with temperature incubation, 37° C. being the best temperature for total yield of sterol. With longer period of incubation, the percentage of sterol increased, even after the mycelium began to autolyze. Restricted or forced aeration of the culture flasks did not affect growth or sterol production but caused a corresponding decrease or increase in the rate of fermentation.

"The highest percentage of sterol (2.23 percent) was obtained in a medium with low concentration of urea (0.5 percent), adjusted to pH 2.0 and incubated

at 37°. This medium gave also the highest yield of sterol (134 mg.) per 100 cc. and the highest yield per gram glucose fermented (6.7 mg.)."

The chemistry of mold tissue.—X, The phospholipides of Aspergillus sydowi, D. W. Woolley, F. M. Strong, W. H. Peterson, and E. A. Prill. (Univ. Wis.). (*Jour. Amer. Chem. Soc., 57 (1935), No. 12, pp. 2589–2591*).—The tenth of these papers deals with ether-soluble phospholipides of *A. sydowi*, which were found to be a mixture of lecithin and cephalin. From the mycelium phospholipides amounting to 0.4–0.7 percent were isolated. Glycerophosphoric acid, choline, cholamine, and oleic acid were identified as the chief hydrolysis products. Stearic, palmitic, and a more unsaturated acid were also probably present in small quantities.

The chemistry of mold tissue.—XI, Isolation of leucine and isoleucine from Aspergillus sydowi; XII, Isolation of arginine, histidine, and lysine from Aspergillus sydowi; XIII, Isolation of some monoaminomonocarboxy and some monoaminodicarboxy acids from Aspergillus sydowi; XIV, Isolation of cyclic choline sulfate from Aspergillus sydowi, D. W. Woolley and W. H. Peterson. (Univ. Wis.). (*Jour. Biol. Chem., 114 (1936), No. 1, pp. 85–90; 118 (1937), No. 2, pp. 363–370; 121 (1937), No. 2, pp. 507–520; 122 (1937), No. 1, pp. 213–218, fig. 1*).—The authors report in paper 11 of this series the isolation of leucine and isoleucine in considerable quantities by extracting the dried, defatted mycelium of *A. sydowi* with acetone. "From this method of extraction it was concluded that these amino acids must be present either free in the mycelium or held in rather loose combination." The amino acids were characterized by analysis and by the preparation and examination of two or more derivatives.

In the work noted in paper 12 arginine, histidine, and lysine were isolated from *A. sydowi* and identified by examination and analysis of suitable derivatives. Histidine and lysine were isolated from an autolysate of the mycelium, but arginine could not be obtained from such a solution, as it was destroyed during autolysis. Arginine was isolated from both the water extract of the mycelium and the acid hydrolysate of the water-insoluble residue. Most of the arginine was present in the combined form.

Paper 13 reports upon the isolation of aspartic and glutamic acids, tyrosine, leucine, proline, isoleucine, valine, serine, threonine, and tryptophan from an autolysate of the mycelium of *A. sydowi*. These were identified by analysis of the free acids and by examination and analysis of suitable derivatives. A considerable percentage of the nitrogen of the mycelium was contained in these pure compounds.

Paper 14 notes that cyclic choline sulfate has been isolated from the mycelium of *A. sydowi* and identified by analysis and by the examination of suitable degradation products, 0.26 percent of the dry mycelium having been obtained as this compound. Since there were losses due to the solubility of the phosphotungstate, however, it is believed that probably considerably more was present. The substance was obtained both from an autolysate and from an acetone extract of defatted mycelium.

Crystalline enzymes: The chemistry of pepsin, trypsin, and bacteriophage, J. H. Northrop (*New York: Columbia Univ. Press, 1939, pp. XV+176, figs. 48*).—This monograph, based on the Jesup lectures given at Columbia University in the spring of 1938, contains the results of a series of investigations on the isolation and chemistry of bacteriophage and the proteolytic enzymes carried out in the author's laboratory. "Bacteriophage has not been crystallized and may not be an enzyme, but the results of the experiments

with bacteriophage are essentially similar to those obtained with the enzymes and are, therefore, included in the present volume."

The contents are general chemistry of enzymes; pepsin; pepsinogen; chymo-trypsinogen and chymo-trypsin; trypsinogen, trypsin, and trypsin-inhibitor; carboxypeptidase; and bacteriophage, together with an appendix dealing with the preparation and crystallization of the enzymes, a bibliography of the more recent work in this field, and a general index.

Respiratory enzymes, C. A. ELVEHJEM, P. W. WILSON, ET AL. (*Minneapolis, Minn.: Burgess Pub. Co., 1939, pp. [4]+236, figs. [10]*).—This is a compilation of surveys of various divisions of the field of enzyme practice and theory, prepared by various investigators at the University of Wisconsin, as follows: Historical Introduction, by C. A. Elvehjem (pp. 1–17); Dehydrogenases, by V. R. Potter (pp. 18–35); The Oxidases, Catalase, and Peroxidase, by M. A. Lipton, A. Arnold, and J. Berger (pp. 36–68); Coenzymes, by C. A. Baumann and F. J. Stare (pp. 69–90); Carriers—Cytochrome, by R. H. Burris (pp. 91–101); Flavoproteins, Ascorbic Acid, Glutathione, and Adrenochrome, by I. E. Stark, E. S. Gordon, and W. B. Christensen (pp. 102–134); Inhibition of Dehydrogenases and Related Systems, by P. P. Cohen (pp. 135–155); Hydrogen Transport Systems, by H. A. Schneider (pp. 156–165); Oxidation-Reduction Potentials and Their Applications in Biological Systems, by A. E. Axelrod and M. J. Johnson (pp. 166–200); and Physical-Chemical Theory of Enzyme Reactions, by P. W. Wilson (pp. 201–236).

Biocatalytic activators specific for the yeast fermentation of maltose, M. J. BLISH and R. M. SANDSTEDT. (Nebr. Expt. Sta.). (*Jour. Biol. Chem., 118 (1937), No. 3, pp. 765–780, figs. 3*).—Flour (especially from malted wheat) and dried yeast preparations, respectively, were shown to contain accelerators that are specific for maltose fermentation and are distinguished by their ability to eliminate or greatly shorten the induction period, to increase fermentation rate, and to reduce the "fermentation deficit." The maltose fermentation accelerator (designated "factor M" which was found by the authors in dried yeast preparations is sharply distinguishable from the previously known factor Z by its great instability toward heat and toward alcohol.

The effect of inhibitors on succinoxidase, V. R. POTTER and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Jour. Biol. Chem., 117 (1937), No. 1, pp. 341–349*).—In tissues from rats and chickens succinic acid dehydrogenase was found in greatest quantities in the kidney, followed in order by the liver and brain. The enzyme system as it occurs in suspensions of homogenized chick kidney was found to be inhibited by cyanide, sodium celenite, and sodium arsenite, whereas sodium fluoride, sodium selenate, and sodium arsenate were relatively nontoxic. Malonic and oxalic acids inhibited the oxidation of succinic acid by the system, but glutaric, adipic, aspartic, malic, and fumaric acids caused much less inhibition. Of the acids mentioned only malic and fumaric were oxidized by the preparation to a significant extent.

A microtitration method for determining the readily soluble boron in soils, R. L. COOK and C. E. MILLAR. (Mich. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 3 (1938), pp. 146–152, figs. 2; abs. in Michigan Sta. Quart. Bul., 22 (1939), No. 1, pp. 44, 45*).—The method may be outlined as follows: Extract the boron from a 100 gm. sample of soil with 100 cc. of boiling H_2SO_4 of sufficient strength to dissolve carbonates and leave the solution acid. (0.02 N H_2SO_4 for samples free of carbonates is advised.) Make the extract alkaline with Na_2CO_3 and evaporate to dryness. Take up the residue with H_2SO_4 and CH_3OH and distill as CH_3BO_3 into water made alkaline with Na_2CO_3. Add one drop rosolic acid, evaporate to a small volume, make acid with HCl, and expel the CO_2 by

heating. Adjust the pH to approximately 7.5 with 0.1 N HCl or NaOH. Add sufficient mannitol to dissociate the boric acid and titrate with 0.01 N NaOH.

Tests made with greenhouse and field soils showed the lower limit of sensitivity of the test to be approximately 0.025 mg. B_2O_3.

Factors affecting the recovery of hydrocyanic acid from fumigated citrus tissues, E. T. Bartholomew, W. B. Sinclair, and B. E. Janes (*Hilgardia [California Sta.], 12 (1939), No. 7, pp. 473–495, fig. 1*).—The authors devised methods (1) for handling quantitatively as little as from 10 to 15 mg. of anhydrous liquid hydrocyanic acid, and (2) for distilling, recovering, and determining the hydrocyanic acid content of citrus leaves and fruit.

Hydrogen sulfide from the fumigated citrus leaves and fruits passed over into the distillate and interfered with the determinations of hydrocyanic acid with standard silver nitrate. This trouble was overcome by placing cadmium sulfate in the distillation flask at the time of making the first distillation (from fruits) or second distillation (from leaves). Since citrus leaves and fruits are already acid, only a small amount of concentrated sulfuric acid had to be added to insure the recovery of the hydrocyanic acid during distillation. No destruction of the hydrocyanic acid occurred as a result of using sulfuric acid of these concentrations, and even better recoveries of hydrocyanic acid were obtained than when the tissues were distilled in the presence of a 2 percent excess of tartaric acid. When leaf and fruit distillates which contained hydrocyanic acid were allowed to stand, "some unknown substance in the distillate continued to combine slowly with the hydrocyanic acid so that it would not react when titrated with standard silver nitrate." The experimental results indicate that citrus leaves and fruits fix or alter a portion of the hydrocyanic acid during the fumigation period so that it cannot be recovered by distillation. Approximately 85 percent of the hydrocyanic acid could be recovered from mature leaves and 73 percent from immature leaves. Less hydrocyanic acid could be recovered from leaves that had been finely ground before being fumigated than from fumigated whole leaves. That hydrocyanic acid penetrates into the tissues and does not merely adhere to the surface was indicated by tests in which leaves were thoroughly washed before distillation and by the fact that hydrocyanic acid could be recovered from the pulp of fumigated fruits after they had been peeled.

The amounts of hydrocyanic acid that could be recovered from citrus leaves and fruits were directly proportional to the amounts of hydrocyanic acid placed in the fumatorium in these tests. Aeration tests with mature fumigated leaves showed that the amounts of hydrocyanic acid that could be recovered from them decreased in roughly inverse proportion to the length of time of aeration. Fifteen percent was recovered from the leaves after 15 hr., but none could be recovered from the fruits after 44 hr.

The use of iodine and other modifications in the Van Slyke manometric amino nitrogen method, A. B. Kendrick and M. E. Hanke. (Univ. Ill. et al.). (*Jour. Biol. Chem., 117 (1937), No. 1, pp. 161–174, figs. 2*).—By the use of potassium iodide in the reaction mixture, the Van Slyke manometric amino nitrogen method was modified to yield theoretical values with cystine and glycine, as well as with other common amino acids. A simplified form of Hempel pipette, believed to make the method more reliable, is also described, together with a method in which the entire analysis is carried out in the Harington-Van Slyke chamber (E. S. R., 69, p. 172). This method, which entirely avoids the use of the Hempel pipette, is recommended as the most convenient and uniformly reliable of the manometric amino nitrogen methods.

Spectral analysis of natural organic substances: The absorption spectrum of some of the most important food fats [trans. title], G. DORTA and M. REGGIANI (*Ztschr. Untersuch. Lebensmtl., 77 (1939), No. 5, pp. 449–459, figs. 7*).—Beef, pork, and horse fats were investigated by spectrographic methods, the absorption in the ultraviolet region being studied. Spectrophotometric records showed that each fat was characterized by absorption bands of definite intensity at certain definite wave lengths. The methods, as applied to the individual fats, or mixtures of them, or to sausage meats containing them, are described in some detail as to the preparation of the sample and the method of obtaining the absorption spectrum. Absorption curves are presented for individual fats and for certain mixtures of them. The curves are considered sufficiently characteristic to permit of detecting 5 percent or less of a particular fat in any mixture. The method is recommended for detecting adulteration of fats or of raw sausage meats.

The determination of phospholipids in bovine blood, G. ELLIS and L. A. MAYNARD. (Cornell Univ.). (*Jour. Biol. Chem., 118 (1937), No. 3, pp. 701–709, fig. 1*).—The method here proposed differs from that generally used mainly in the manner in which the solvents are removed from the alcohol-ether extract. When the evaporation of the alcohol and ether was carried out under reduced pressure, petroleum spirit was effective as a solvent for the residue, but when the precaution of using reduced pressure was omitted petroleum spirit did not dissolve the phospholipides completely. Some other modifications were found to improve the convenience of the procedure.

The photometric determination of cystine, cysteine, ascorbic acid, and related compounds with phosphotungstic acid, B. KASSELL and E. BRAND (*Jour. Biol. Chem., 125 (1938), No. 1, pp. 115–129*).—Cystine in the presence of sulfite gives a blue color with phospho-18-tungstic acid, whereas cystine alone develops no color. In the presence of the color reagent acting as hydrogen acceptor, cysteine without the presence of sulfite also gives the color reaction. Certain extraneous substances may alter the course of the color development, but, as shown by Lugg, mercuric chloride prevents color development of the –SH compounds and makes it possible to estimate the contribution of extraneous reducers to the total coloration. The present study, based upon these findings, represents a photometric adaptation wherein the extinction coefficients are determined on a series of solutions made up with and without mercuric chloride and buffered sodium sulfite, respectively, thereby giving a measure of the reducing effect of the sulfite blank, extraneous substances, cysteine, and cystine. The molecular extinction coefficient of reduced phospho-18-tungstic acid determined with a number of reducing substances yields the same value (ϵ=8,200 with filter S–72) in every case. A special method for the simultaneous photometric determination of cystine, cysteine, and ascorbic acid is also described. This is based on the observation that cadmium chloride retards the oxidation of ascorbic acid by mercuric chloride but not by phospho-18-tungstic acid. S–S and –SH compounds on the other hand give no color in the presence of a mixture of cadmium chloride and mercuric chloride.

The method is of value in the analysis of normal and cystinuric urine and in the determination of the cystine content of protein. A micromodification is described which permits the determination of cystine and cysteine with 10–20 mg. of protein for hydrolysis.

A method for the determination of nicotinic acid, nicotinamide, and possibly other pyridine-like substances in human urine, S. P. VILTER, T. D. SPIES, and A. P. MATHEWS (*Jour. Biol. Chem., 125 (1938), No. 1, pp. 85–98, fig. 1*).—The test described depends upon the color developed when nicotinic

acid or nicotinamide is fused at 100°–105° C. with 2,4-dinitrochlorobenzene and the fusion mixture is dissolved in dilute alcoholic sodium hydroxide. The free acid, as well as its sodium salt, gives a deep purple color, whereas the amide gives a Burgundy red (yellow red in dilute solutions). The diethyl substituted amide (coramine) again gives a purple color. No color is developed with the related compounds trigonelline or picolinic acid. As applied to urine, 3 cc. of the decolorized specimen in a 30-cc. beaker are evaporated just to dryness at 80°–100°, then treated with 1 cc. of an alcoholic solution of the reagent (1 gm. of 2,4-dinitrochlorobenzene in 100 cc. of alcohol). The mixture, after standing at room temperature 1–3 hr., is again evaporated to dryness and then heated for 10 min. at 105°. After cooling to 25° or below, 10 cc. of a cold solution of 0.1 percent NaOH in 95 percent alcohol are added, the residue is stirred from the bottom, and the solution is made up to 15 cc. with more of the alcoholic NaOH, quickly filtered, and then transferred to the photelometer cell. Using a green filter, the percentage transmission of green light is read from the scale. In the case of pure red or purple urinary colors, the amount is read from the nicotinamide or nicotinic acid curves, respectively, these calibrated curves having been previously established from readings on standard solutions. If the color is a mixture of red and purple only an approximation can be obtained with the photelometer.

Application of the method to pellagra-preventing foods such as liver and yeast shows that they contain substances giving the nicotinic acid reaction. Due to interfering pigments the method does not permit of a quantitative determination. Pigment interference also prevents successful application of the method to blood serum. As applied to human urine, the method indicates that individuals on a normal diversified diet excrete daily color-producing substances equivalent to 20–50 mg. of nicotinic acid or its conjugates. Pellagrins in relapse, or in the first acute disease, or normal individuals on a diet such as pellagrins usually consume, excrete little if any color-producing nicotinic acid derivatives. It is suggested, therefore, that the method may be useful as a confirmatory test of the pellagrous and prepellagrous states and for studying the excretion of nicotinic acid and other closely related substances that respond to this color test.

The determination of vitamin B_2 (lactoflavin) in yeast [trans. title], F. Reindel and O. Fleischmann (*Biochem. Ztschr., 301 (1939), No. 1–2, pp. 99–104, fig. 1*).—The present study deals with certain details and modifications of the method of R. Kuhn and associates. In principle the method involves conversion of the lactoflavin, by means of suitable irradiation, into lumilactoflavin, which is then taken up in chloroform and determined colorimetrically. A device developed by the authors for irradiation of the flavin in water solution is illustrated and described. Using two 100-w. lamps as the light source, a 2-hr. irradiation period gives the maximum concentration of lumiflavin. With a quartz lamp this period is reduced by ½ hr. Longer periods of irradiation are associated with a loss of lumiflavin indicated to amount to 36.5 percent with solutions containing 15 mg. of lactoflavin per 1,000 cc. The authors also indicate that the purification of the vitamin by absorption and elution always results in some loss, but that this step is not necessary since the chloroform exerts a selective absorption of the lumiflavin. The colorimetric determination is made with a Zeiss step-photometer in which the scale reads directly in terms of percentage of light absorption. Reference tables give the conversion values in terms of milligrams of lactoflavin. The values for these tables are derived from readings on standards of the purified lactoflavin carried through the various steps of the determination.

Separation of lactoflavin (vitamin B_2) and lactoflavin phosphate, A. Emmerie (*Rec. Trav. Chim. Pays-Bas, 58 (1939), No. 3, pp. 290–292*).—In preliminary experiments to determine the distribution of lactoflavin and lactoflavin phosphate between an aromatic alcohol and water, with varying salt concentrations and acidity, it was found that 70–79 percent of the lactoflavin was dissolved in the alcohol fraction whereas 98–99 percent of the lactoflavin phosphate went into the aqueous fraction. These results were obtained with benzyl alcohol, with phenylethanol, and with phenylpropanol. From three to four extractions with equal volumes of benzyl alcohol were required to practically complete the removal of lactoflavin. Applying this separation to urinary excretion, a specially prepared extract of the urine is shaken with benzyl alcohol. The difference between the intensity of the color of the aqueous extract before and after benzyl alcohol extraction is due to lactoflavin, whereas the intensity of the color of the aqueous extract remaining after the benzyl alcohol extraction is due to lactoflavin phosphate.

The determination of ascorbic acid in urine with the photoelectric colorimeter, K. A. Evelyn, H. T. Malloy, and C. Rosen (*Jour. Biol. Chem., 126 (1938), No. 2, pp. 645–654, figs. 2*).—The method described for the determination of ascorbic acid in the presence of other reducing agents is based on differences in the rate at which the dye is decolorized. Whereas the ascorbic acid reaction is complete in 5 sec., the presence of other reducing substances causes the reaction to continue beyond this time. By the procedure outlined, an excess of the dye is mixed with an aliquot of urine, and the amount of dye decolorized is measured in a photoelectric colorimeter at 5-sec. intervals until the reaction is complete. The velocity curve plotted from these results is extrapolated back to 0 time, the amount of decolorization at this point being due essentially to the ascorbic acid alone. The method is admittedly empirical, but this is more than compensated for by the greater accuracy of the photoelectric determination as compared with that of the visual titration procedure. The method does not require standardization of the dye solution, eliminates errors due to interfering colored substances, and permits the rapid completion of the measurement, thus greatly reducing errors due to nonascorbic acid reducing substances.

Modifications employing the mercuric acetate procedure of Emmerie and van Eekelen (E. S. R., 73, p. 583) or the preliminary precipitation with solid barium acetate indicated that the former is of no particular value in the photoelectric determination, but that the latter is both safe and desirable. Comparative determinations by the present method and by the visual titration procedure show that the titrimetric method may be quite accurate when the ascorbic acid content of the urine is high, but that it apparently gives results 2–10 times too high if the ascorbic acid content is low. With the new method 24-hr. ascorbic acid excretions of less than 5 mg. are often found in normal healthy individuals on adequate well-balanced diets.

A method for the determination of small quantities of ascorbic acid and dehydroascorbic acid in turbid and colored solutions in the presence of other reducing substances, O. A. Bessey (*Jour. Biol. Chem., 126 (1938), No. 2, pp. 771–784*).—The method, which is described in detail, involves the preparation of a 3 percent metaphosphoric acid extract of the unknown. The extract, buffered to a pH of 3.5–3.7, is added to an aqueous solution of the 2,6-dichlorophenolindophenol reagent in a quantity insufficient to reduce the dye completely. The decrease in the concentration of the colored oxidized form of the dye is measured by means of the photoelectric colorimeter. From this reading, with certain corrections, the ascorbic acid content is calculated. A similar deter-

mination is also carried out using an aliquot of the buffered extract that has been reduced with H_2S, any excess of the sulfide having been first removed. The difference between the readings of the two determinations gives a measure of the dehydroascorbic acid present. The use of the photoelectric colorimeter eliminates the need for standardizing the dye solution, and also eliminates the errors incident to end-point determination by the subjective visual titration procedure. The instrument is operated in a manner to correct automatically for turbidity of extraneous pigments. Data presented for ascorbic acid determinations in turbid and colored solutions indicate a precision of 1–3 percent on solutions containing 6–20 μg. of ascorbic acid.

Data for determinations by this method are reported for the ascorbic acid and dehydroascorbic acid content of various fruits and vegetables (including highly colored berry juices and beets) and of rat liver and kidney tissue. These results are discussed, and additional experiments are reported to show that the metaphosphoric acid gave complete extraction of these tissues.

Colorimetric determination of tocopherol (vitamin E).—II, Adsorption experiments, A. Emmerie and C. Engel (*Rec. Trav. Chim. Pays-Bas, 58 (1939), No. 3, pp. 283–289, fig. 1*).—Since carotenoids and vitamin A interfere with the colorimetric determination of tocopherol by the ferric chloride-dipyridyl reagent, adsorption experiments were carried out in an effort to find a method for separating these interfering substances from the tocopherol. It was found that a fuller's earth especially purified by treatment with strong hydrochloric acid did not adsorb the tocopherol from a benzene solution, whereas it did quantitatively adsorb both vitamin A and carotene. Aluminum oxide did not effect such a separation, however, since it was found capable of adsorbing all three of these substances from a petroleum ether solution and of releasing all three again upon elution with methanol. The adsorption and elution were quantitative.

A vitamin A concentrate was subjected to purification in order to determine whether the reaction with the ferric chloride-dipyridyl reagent was due to the vitamin A itself or to impurities. In the purification procedure the vitamin A from the concentrate was adsorbed on alumina, from which successive eluates with petroleum ether and benzene were obtained. These eluates, as well as an unsaponified fraction from the concentrate, all contained vitamin A, as indicated by the Carr-Price reaction, and all reacted with the ferric chloride-dipyridyl reagent. The fractions giving the strongest vitamin A test also showed the greatest content of tocopherol as judged by color development with this ferric chloride-dipyridyl reagent. Further experiments in which the concentrate was subjected to preliminary oxidation with the reagent showed that over long periods destruction of the vitamin was effected (81 percent destruction in 22 hr.). Further studies showed that α- and β-carotene, a wheat germ oil concentrate, and vitamin A preparations all behaved quite differently from tocopherol with regard to the reaction velocity with the reagent.

Jellying and crystallization of sirups made from different parts of the sorgo stalk at different stages of maturity, E. K. Ventre, S. Byall, and C. F. Walton, Jr. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 59 (1939), No. 2, pp. 139–150*).—A study of sirups made from various parts of the stalks of *Holcus sorghum saccharatus* and from whole stalks showed that the starch content and jellying of sorgo sirups are correlated and increase with maturity of the sorgo. The upper portions of the stalk produced sirups higher in starch content. The number of parts of the stalk yielding sirups that jelly increased with maturity. Sucrose crystallization occurred most frequently in sirups

made from the upper part of the sorgo stalk. The number of parts of the sorgo stalk yielding sirups from which sucrose crystallizes increased with maturity. Dextrose crystallization occurred most frequently in sirups made from the lower portions of the stalk. The number of portions of the stalk yielding sirups from which dextrose crystallizes decreased with maturity. It was found that, within the range of densities applying to farm-made sorgo sirups, either sucrose or dextrose may crystallize from sirups from different parts of the same stalk. When the ratio of sucrose to reducing sugars in the sirup was 1.15 or greater sucrose crystallized, and when the ratio of reducing sugars to sucrose was 1.04 or greater dextrose crystallized. By proper selection of the parts of the stalk for milling, either sucrose or dextrose could be obtained from the sorgo plant. Jellying and either sucrose or dextrose crystallization may occur in the same sirup.

The preparation and painting of maple-sugar-producing equipment, C. O. Willits and C. J. Tressler, Jr. (N. Y. State Expt. Sta.). (*Jour. Agr. Res. [U. S.], 59 (1939), No. 2, pp. 151–158, fig. 1*).—A commercial synthetic resin enamel and two commercial aluminum paints were all found very effective for protecting sap from solution of lead from sap buckets. It was observed that the greatest danger of excessive lead content in maple sirup occurs in the abnormal collecting conditions of prolonged contact with the bucket of sap which has been allowed to become very sour. Such extreme conditions rendered the paints ineffective in some instances.

It is further noted that, when painting metal buckets that have been painted before, the best results are obtained if the old paint is entirely removed. A 10 percent solution of commercial trisodium phosphate, when used at or near the boiling temperature, is a very cheap and effective paint remover. For wooden buckets that have been previously painted, better results are obtained if one of the approved paints is applied over the old paint, any loose old paint being first removed by brushing. If allowed to cure for 3 weeks or more after painting, none of the paints used in these experiments imparted any color, flavor, or odor to either the sap or the sirup.

Experimental work on processing and finishing pickles.—I, Rate of diffusion of salt from pickles during the freshening process, R. G. Switzer, D. E. Richardson, and F. W. Fabian. (Mich. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 18 (1939), No. 9, pp. 260, 261, 281, 283, figs. 2*).—It was found that for maximum efficiency salt stock pickles should be freshened at 70° F. or above. Eight-hr. freshening periods are recommended, since about 95 percent of the salt which is capable of being removed in 12 hr. has diffused out in the first 8 hr. When circumstances warrant, salt stock pickles may be completely freshened in about 8 to 10 hr. by circulating fresh water through the tank at a moderate rate.

[Pickle preservation work by the North Carolina Station] (*North Carolina Sta. Rpt. 1938, pp. 52, 53*).—Work carried out with commercial manufacturers is reported upon by I. D. Jones, O. Veerhoff, M. K. Veldhuis, and J. L. Etchells.

AGRICULTURAL METEOROLOGY

Monthly Weather Review, [March–April 1939] (*U. S. Mo. Weather Rev., 67 (1939), Nos. 3, pp. 61–88, pls. 14, fig. 1; 4, pp. 89–124, pls. 12, figs. 16*).—In addition to the usual detailed summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, and bibliographical and other information,

these numbers contain the article noted on page 18 and the following contributions:

No. 4.—Wind and Radiation, by W. J. Humphreys (p. 89); Minimum Temperatures During Spring and Autumn at Lincoln, North Platte, and Scottsbluff, Nebr., by H. E. Hoy (pp. 89–94); The Diurnal Variation of Summer Rainfall at Denver, by A. W. Cook (pp. 95–98); Airport and City Temperatures at Detroit, Mich., by C. J. Root (p. 99); and Computation of Depth of Precipitable Water in a Column of Air [by a tabular method based on aerological observations], by S. B. Solot (pp. 100–103).

[Meteorology papers and abstracts] (*Ind. Acad. Sci. Proc., 54 (1938), pp. 46, 116, 117, 137–142*).—These pages include an article entitled Indiana Data on Lightning, Hail, Squall-wind, and Tornado Frequencies and Damage, by S. S. Visher (pp. 137–142), and abstracts of the following papers: Microclimate, Evaporation, and Epiphytic Mosses, by J. E. Potzger; and Further Studies of Certain Atmospheric Variations, by A. V. Lott.

Outline of physics of the clouds, I–III (*Bul. Amer. Met. Soc., 20 (1939), No. 6, pp. 235–247*).—This outline, translated from the German by K. O. Lange and C. F. Brooks, includes the following: I—Micro-physics of the Clouds, by W. Findeisen; II—Macro-physics of the Clouds, by W. Peppler; and *III—Physical* Synoptics of Clouds, by T. Bergeron.

Atlas of climatic charts of the oceans (*U. S. Dept. Agr., Weather Bur., 1938, pp. VI, pls. 65*).—"The charts in this atlas have been derived from approximately 5½ million observations taken on ships at sea during a period of more than 50 yr."

Barometers and the measurement of atmospheric pressure, C. F. Marvin (*U. S. Dept. Agr., Weather Bur. Cir. F, 6. ed. (1939), pp. II+91, figs. 31*).—"A pamphlet of information respecting the theory and construction of barometers in general, with summary of instructions for the care and use of the standard Weather Bureau instruments," an earlier edition of which has been noted (E. S. R., 13, p. 118).

[Weather data], J. I. Wood and N. W. Nance (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 1939, Sup. 110, pp. 158–173, figs. 22*).—The method of presentation employed in this summary is by means of maps showing by States the departures from normal temperatures and the percentage of normal precipitation during each of the four seasons and graphs showing accumulated and monthly temperatures and rainfall at six stations selected as representative of the different regions of the United States (1937).

Pressure and temperature variations in the free atmosphere and their effect on the life history of cyclones, B. Haurwitz (*Bul. Amer. Met. Soc., 20 (1939), No. 7, pp. 282–287*).—The stratospheric-steering and the polar-front theories are said to account about equally well for the relations between the upper and lower atmosphere brought out by the study here reported. However, unstable waves at the tropopause do not appear to be possible so that they cannot form spontaneously. At the polar-front surface, on the other hand, conditions are favorable for the formation of instability waves. It therefore seems more likely that the cyclonic perturbations have their origin here and produce the disturbances in the upper atmosphere which may persist even after the occlusion process in the lower layers has taken place.

The importance of meteorological studies in the design of flood control structures, G. A. Hathaway (*Bul. Amer. Met. Soc., 20 (1939), No. 6, pp. 248–253, figs. 5*).—A discussion reflecting the nature of a few meteorological problems affecting the engineer and emphasizing the importance of reliable solutions.

Accurate estimates of the limiting storm conditions, it is believed, would justify lower expenditures by eliminating the necessity for the large factors of safety now essential for security. Solution of this problem is posed as a challenge to the meteorologist.

Atmospheric humidity and temperature in relation to the water system of plants and soils, C. A. SHULL (*Plant Physiol., 14 (1939), No. 3, pp. 401–422, figs. 4*).—Critically reviewing his own work and that of others (30 references), the author concludes that we are coming to see and understand more fully the basic importance of relative humidity and temperature of the atmosphere in relation to the water system of plants and soils, and he focuses attention on the fundamental causes of changes in these water systems as these changes relate to the physiology of the organism. These water relations are important because maximum plant production depends on the plant's ability to gather in materials and create plant substances from them. A full understanding of all the water relations is fundamental to an intelligent management of the plant's environment, and an attempt is here made to clarify particularly the relation of the water vapor phase of the atmosphere to the water economy of plants in general.

Growth rings of the oak as related to precipitation in Illinois, G. D. FULLER (*Ill. State Acad. Sci. Trans., 31 (1938), No. 2, pp. 102–104, fig. 1*).—Tree-ring counts and measurements in 1937 in a red oak tree approximately 100 yr. old compared with precipitation data from 1871 to 1937 led to the conclusion that in this instance a very close correlation was evident between the precipitation for the calendar year in Illinois and the increase in diameter as shown by the thickness of the annual growth ring.

Frost protection of ferns by sprinkler irrigation, R. T. SHEROUSE (*U. S. Mo. Weather Rev., 67 (1939), No. 3, pp. 61, 62, fig. 1*).—Protection of ferns from frost injury by spraying water continuously on the plants during periods of damaging temperatures proved successful on a 4-acre plat during the cold weather of the 1937–38 winter season at Fern Park, Fla. The facts brought out by this test are taken to indicate the reasonable possibility that frost damage to low-growing, tough, woody plants may be prevented at moderate cost by means of sprinkler irrigation properly managed, especially in the case of ferns, which appear to suffer no harm from being coated with ice provided the temperature of the ice is maintained at 32°F. by continuous spraying.

SOILS—FERTILIZERS

[Soil investigations by the North Carolina Station] (*North Carolina Sta. Rpt. 1938, pp. 11–14, 15–22*).—These have included studies of soil deficiencies, by L. G. Willis; the relative dependability of chemical analyses and field plat experiments in formulating fertilizer recommendations for crops, by J. R. Piland and Willis; a laboratory investigation of certain inherent soil properties which affect the erosiveness and fertility of soils, by J. F. Lutz; studies of the factors affecting the aggregation of soil and its effect on run-off and erosion, by Lutz and J. Elson; a study of fertilizer and rotation practices in Franklin and Wilson Counties, by C. B. Williams, Lutz, and R. E. L. Greene; numerous fertilizer studies with the T. V. A., by W. W. Woodhouse; and similar studies by E. R. Collins, N. E. Rigler, J. J. Skinner, Williams, and W. H. Rankin.

[Soil Survey Reports, 1933 and 1935 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1933, Nos. 26, pp. 83, pls. 3, figs. 4, map 1; 28, pp. 34, figs. 3, map 1; 30, pp. 32, figs. 2, map 1; 1935, Nos. 5, pp. 48, pls. 2, figs. 2, map 1; 9, pp. 34, figs. 2, map 1*).—Except as indicated below, these

surveys were made in cooperation with the respective State experiment stations: 1933, Nos. 26, Contra Costa County, Calif., E. J. Carpenter and S. W. Cosby, 28, Johnson County, Wyo., T. J. Dunnewald et al., and 30, Ida County, Iowa, T. H. Benton and W. J. Geib; and 1935, Nos. 5, Garfield County, Okla., E. G. Fitzpatrick et al., and 9, Frontier County, Nebr., S. R. Bacon et al. (Univ. Nebr.).

Agricultural areas of Mississippi, R. Coleman (*Miss. Farm Res. [Mississippi Sta.], 2 (1939), No. 8, p. 7, fig. 1*).—The author gives brief popular descriptions of 10 groups of soils, indicating the general productivity, fertilizer needs, physical condition, and crop adaptabilities of each.

Farming peat lands in Wisconsin, A. R. Albert (*Wisconsin Sta. Spec. Bul., 1939, Feb., pp. 4*).—Potassium salts were found the main fertilizer needed, 150 lb. per acre of a fertilizer of 50 percent potash content needing to be doubled to maintain production in a 4-yr. rotation. The peat land showed no need for lime in the glacial drift area, but west of this area more tendency to acidity was found. Phosphates caused lodging of grain, but applications equivalent to 80 lb. of phosphoric anhydride per acre per 4-yr. rotation benefited a number of other crops. Nitrogen fertilizers did not give consistent improvement in yields. Row application of fertilizers was found generally the most profitable. Crop adaptabilities are discussed in some detail.

Studies in electrodialysis of soils.—IV, Effect of temperature, pH value, and degree of alkalization, A. N. Puri, R. C. Hoon, and C. L. Dhawan (*Soil Sci., 47 (1939), No. 6, pp. 479–485, figs. 3*).—Electrodialysis of soils at different pH values and varying degrees of alkalization indicated that the rate of electrodialysis increases with the increase in pH value. The variations in the ratio of Ca to Na in the electrodialyzate of alkali soils were found to agree with the hypothesis that the cause of infertility in such soils lies in the deficiency of available Ca. The rate of electrodialysis reached a maximum at about 30° C., but the effect of temperature, on the whole, was slight. The work here noted is a further development of the technic evolved in the preceding studies of this series (E. S. R., 79, p. 587).

Rates of temperature changes in soils at various moisture contents, H. A. Wadsworth. (Hawaii Expt. Sta.). (*Soil Sci., 47 (1939), No. 6, pp. 467–471, figs. 4*).—*Noting that the change in temperature occurring in an inert, homogeneous* body immersed in a medium having a temperature different from its own follows an exponential law with respect to temperature changes of which the logarithmic expression plots as a straight line, the author shows that distilled water, dry sand, and oven-dried soils gave data fitting the expected straight lines, but the data for the cooling or warming of moist soils yielded curves convex toward the origin when the excessive differences of temperature between the soil and its surrounding medium were plotted against time. Such observations tend "to support the assumption that the simple cooling of a soil generates heat." When cold soils were warmed, heat was absorbed without a corresponding temperature increase. "Although the moisture limits within which these phenomena are apparent have not as yet been defined, there is some evidence that the percentage of moisture within the soil must lie between the maximum field capacity and a very low moisture content if the effect is to be noted."

The logarithmic statement of the temperature difference law was used in this work in the form, $\log_{e}\theta t = K - at$, in which θ is the temperature difference between the substance studied and the surrounding medium after the lapse of time t, and K and a, are constants consolidated in the manipulation of the exponential equation into logarithmic form.

Effect of temperature upon the moisture-content—surface-force curve of soil, H. A. Wadsworth. (Hawaii Expt. Sta.). (*Soil Sci., 47 (1939), No. 6, pp. 473–478, fig. 1*).—The author presents evidence in support of the belief that the position of the surface force-moisture content curve over a considerable range depends upon the temperature at which the relations are noted. He shows that, in general, a lowering of the temperature at which the determination is made, within certain limits, increases the moisture content of a soil in equilibrium with a specified relative humidity. One of the soils studied gave some evidence that the curves cross at a relatively high humidity. A reduction of the temperature below normal room temperature seemed to be more effective in shifting the curve yielded by Superior clay loam than was a corresponding increase above room temperature.

Effect of saline water on Mediterranean loess soils, M. Puffeles (*Soil Sci., 47 (1939), No. 6, pp. 447–453*).—The author finds that the loess soils of the Beersheba area are highly permeable to air and water and possess good physical properties but are poor in nutrients. The presence of large quantities of lime tends to preserve the stability of the natural properties of the soil and to decrease the rate of deterioration. If, however, the very saline water that is available is used for irrigation under favorable climatic and drainage conditions, such as obtain in this area, the salts will not accumulate but in time an alkaline soil will be formed by base exchange. This soil will eventually be useless for agricultural purposes.

Nitrogen and organic carbon of soils as influenced by cropping systems and soil treatments, W. H. Metzger (*Kansas Sta. Tech. Bul. 45 (1939), pp. 36, fig. 1*).—In plats started in 1910 and sampled for carbon and nitrogen determination in 1915, a 16-yr. rotation, a 3-yr. rotation, and continuous wheat produced fairly similar losses of nitrogen and carbon. The 16-yr. rotation lost nitrogen more rapidly than the other two systems, but the 3-yr. rotation led in rate of loss of carbon. Alfalfa grown continuously increased the soil nitrogen and carbon by 0.71 and 0.43 percent per year, respectively. Corn appeared to dissipate these soil constituents at a rate from two to three times that resulting from the rotations or continuous wheat. Continuous alfalfa appeared to add to the soil nitrogen throughout a period of 19 yr. Where alfalfa cropping periods varied from 1 to 9 yr., there was some indication that the average increase in nitrogen in plats cropped from 5 to 9 yr. was about twice that in plats cropped for from 1 to 4 yr. Alfalfa increased the nitrogen content of the soil even though all top growth was regularly removed as hay.

Studies of the nitrate content of wheat land previously cropped to alfalfa indicate a rather marked decline in nitrate-accumulating capacity in about 6 yr. after breaking the alfalfa sod. This was true of alfalfa cropping periods up to 9 yr., though the plats cropped to alfalfa for the shorter periods declined to lower levels. Residual effects in nitrate-accumulating capacity were evident, however, for 8 yr. or more on all plats cropped to alfalfa for 2 yr. or longer. Continuous wheat culture maintained a wider carbon: nitrogen ratio in the soil than the rotations or continuous alfalfa. Within the continuous wheat experiment, green manuring tended to narrow the ratio.

In general, manure and green manure treatments maintained higher soil nitrogen and carbon levels than control plats. Commercial fertilizers tended to produce similar results, but they were much less marked. In general, the surplus of carbon in treated over untreated plats could apparently be accounted for by increased crop residues. Much or all of the nitrogen could usually be accounted for in like manner. "A very notable exception was the green manure

treatment in the continuous wheat experiment. Of the nitrogen calculated to have been applied in the manure and green manure treatments, the following portions were indicated to have remained in residual form in the soil: 16-yr. rotation, manure 10.6 percent; green manure and rock phosphate 10 percent; continuous wheat, manure 1.4 percent; green manure 70 percent; green manure plus K_2SO_4 plus superphosphate 25 percent; green manure and rock phosphate 21 percent; continuous alfalfa, manure (2½ tons) 6.5 percent; manure (5 tons) 11 percent; and manure and rock phosphate 16 percent. In the 3-yr. rotation no nitrogen or carbon could be attributed directly to the manure treatments."

Plant growth and the breakdown of inorganic soil colloids, W. A. ALBRECHT, E. R. GRAHAM, and C. E. FERGUSON. (Mo. Expt. Sta.). (*Soil Sci., 47 (1939), No. 6, pp. 455–458*).—Soybeans having been used as a test plant, it was found that complete analyses of the soybean seed and colloidal clay at the outset, and of the crop at the close of the experiment, provided an index of the movements both of the exchangeable and of the nonexchangeable cations in the colloidal clay. The results are considered to suggest that a clay electrodialyzed free of its cations, then saturated with only barium, magnesium, and calcium to a pH of 6.9 or 7.0 and planted to soybeans, is broken down by the plant growth with release of the silicon, aluminum, and iron to the extent of 2 or 3 percent of the total in the clay. "This is the release from a clay of extreme mineralogical stability that was first submitted to the extracting force of electrodialysis for periods as long as 3 weeks, and then to plant root contact for less than 6 weeks. Increasing amounts of clay meant correspondingly increased amounts of these three cations taken by the plants. The percentages of silicon, aluminum, and iron released by the clay in these studies are so low that if the total calcium, potassium, and magnesium in the clay were set free at the same rate, their amounts would be significant in providing the needs of the plants growing on them. These data, suggesting colloidal clay break-down by the plant, offer no encouragement to the belief that the plant can solve its fertility needs in bases by attacking the nonexchangeable stores in the clay fraction of the soil, even though it might obtain enough iron to supply its needs for this single nutrient."

Effect of certain mineral elements on some microbiological activities in muck soils, L. M. TURK. (Mich. Expt. Sta.). (*Soil Sci., 47 (1939), No. 6, pp. 425–445, fig. 1*).—The author studied the effects of copper sulfate, sodium chloride, manganese sulfate, sulfur, boron compounds, and lime, as well as nitrogenous, phosphatic, and potassic fertilizers, on ammonification, nitrification, carbon dioxide production, and bacterial and fungal numbers in several muck soils of widely various reaction and in a peat soil.

Nitrification was slow at pH values below 5.5 and was increased by calcium carbonate in all but one of the acid mucks. Excessive liming hindered nitrification in some instances, however. Formation of ammonia and nitrates was not consistently affected by the copper salt. Though generally beneficial to plant growth, copper sulfate retarded rather than stimulated ammonification and nitrification. Sodium chloride, though stimulating to plant growth on some of the soils studied, decreased nitrate accumulation when applied either with lime or with copper sulfate, potassium salts, and phosphates. Applied without lime, sodium chloride increased nitrification in about one-half the tests. There was no conclusive evidence to indicate that manganese sulfate used at the rate of 400 lb. per acre had either a stimulating or a toxic effect on either the ammonifiers or the nitrifiers. Iron sulfate stimulated nitrification, but no

appreciable effect of KI, $BaCl_2$, Al_2SO_4, $ZnSO_4$, H_3BO_4, or Na_2SO_4 was noted. Sulfur stimulated nitrification in all the naturally alkaline mucks and also in those mucks that were heavily limed.

Carbon dioxide evolution was not effected by liming, fertilizers, or copper sulfate, except for an increase in one muck soil caused by 3-8-24 fertilizer when mannitol had also been added (but not without the mannitol). Sodium chloride decreased carbon dioxide production.

Bacterial and fungal numbers were decreased by 0-8-24 fertilizer. Increases in numbers were obtained when either $CuSO_4$ or NaCl was used with the 0-8-24 fertilizer. The 3-8-24 fertilizer, alone or in combination with NaCl or $CuSO_4$, gave increases in numbers.

Influence of rainfall, cropping, and cultural methods on soil and water losses, R. P. BARTHOLOMEW, D. G. CARTER, W. C. HULBURT, and L. C. KAPP (*Arkansas Sta. Bul. 380 (1939), pp. 48, figs. 10*).—At the main station and at the Fruit and Truck Substation erosion studies were carried out on 6 percent and on 2.9 percent slopes, respectively, and at both stations both on normal soil and on badly eroded soil from which 6 in. of topsoil had been removed. Continuous cropping, rotation, permanent Bermuda grass cover, and fallow with weeds scraped off at the surface were tried at both stations. Both total rainfall and very short period intensity records were kept. The work covered the period from May 1, 1935, to June 30, 1938.

The data indicate that the moisture condition of the soil is a factor, since run-off losses were much higher when the soil was saturated or nearly so. Well established Bermuda sod reduced losses to less than 0.3 percent of the total rainfall recorded during the experiments. In a 3-yr. rotation protection was afforded by ground cover for all except from 5 to 6 mo. Within the rotation, clover was most effective, oats somewhat less effective, and the largest losses occurred while the plats were in corn. The use of rotation tends to increase the ability of the soil to take up water. The increase in permeability of the soil as a result of plowing results in a decrease in run-off. A winter-plowed plat showed no appreciable run-off from January to March 25, 1938, although there were in that time 13 rains which caused run-off from fallow unplowed ground. April plowing on other plats resulted in decreased losses for a limited time. The addition of organic matter by plowing under the crop residue resulted in decreased losses. The eroding of the surface layer tends to accelerate run-off losses. During 2 yr. of record, the run-off loss from the plat from which 6 in. of surface soil had been removed exceeded that of any other cultivated plat. Soil losses are closely related to run-off losses.

The rape of the earth: A world survey of soil erosion, G. V. JACKS and R. O. WHYTE (*London: Faber & Faber, [1939], pp. 313, [pls. 47, figs. 2]*).—The subtitle and chapter headings adequately indicate the scope and nature of this work. The contents are soil erosion; Europe and the Mediterranean; North and South America; Africa; Australia and New Zealand; the Orient; the influence of soil on erosion; the principles of soil conservation; the development of a conservation agronomy; reclamation of gullies; pastures, range, and veld; trees and agricultural conservation; dust, dunes, and deserts; water conservation and flood control; road construction and soil conservation; the conservation of wildlife resources; economic causes and consequences of erosion; political and social consequences of erosion—1, general considerations, 2, the grassland environment, 3, tropical Africa, and 4, Union of South Africa; conclusion; and a general index.

Phosphoric acid, lime, and protein in forage grasses of the east Texas timber country, G. S. FRAPS and J. F. FUDGE. (Tex. Expt. Sta.). (*Soil Sci.*

Soc. Amer. Proc., 2 (1937), pp. 347–351; abs. in Texas Sta. Cir. 83 (1939), p. 19).—Samples of grasses were taken from 9 soil series, 16 species being represented at various stages of growth. Upland soils of the Ruston and Norfolk series produced forage of the lowest composition value, particularly with respect to phosphoric acid. These were followed by upland soils of the Bowie, Lufkin, Susquehanna, and Tabor series. Bottom-land soils of the Ochlockonee series produced forage higher in phosphoric acid, and upland soils of the Wilson and Crockett series produced the highest.

The composition of different species from the same soil and at the same stage of growth varied widely. The composition of the same species from different soils also varied. The work indicates a widespread deficiency of phosphoric acid and a possible deficiency in protein in the forage analyzed.

Values of plants as fertilizers compared with costs of commercial preparations, R. Gardner (*Colo. Farm Bul.* [*Colorado Sta.*], *1* (*1939*), *No. 3, pp. 6–8*).—This is a popular discussion of the value of green-manuring crops, based largely on the money value of the nitrogen, phosphate, and potassium contents of these materials as compared with the current prices of nitrogen as ammonium sulfate, phosphate as treble superphosphate, and potassium as fertilizer potassium chloride. An accompanying table shows for many of the more common green-manuring crops and some other organic fertilizers pounds per ton and value per ton of each of the three elements named and the total fertilizer value per ton.

Effect of various grades of fertilizers on the salt content of the soil solution, L. M. White and W. H. Ross. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *59* (*1939*), *No. 2, pp. 81–99, figs. 13*).—The fertilizers to be tested were mixed with Norfolk sandy loam and with Cecil clay loam soils, and the mixtures were held at a moisture content of 75 percent of the respective moisture equivalent of the soil and at a temperature of 5° C. for 5 days, after which the soil solution was taken from the sample by displacement and its salt content was calculated from freezing-point depression data. Applications of plant food being equal, the phosphates and free ammonia had the least effect on the concentration of the soil solution of both the soils used in the tests, while sodium nitrate and the low-grade potash salts had the greatest effect. Fertilizer mixtures representative of those used in 1880 and in 1910 were compared, with respect to their effects upon the total salinity of the soil solution, with the higher grade mixtures now in use, the present-day mixtures being found to cause much less salinity per unit of plant food applied, in part because of lesser percentages of nonplant food components and in part because of the substitution of "free" ammonia for ammonium salts and nitrates. "While the effect of fertilizers on the concentration of the soil solution does not necessarily decrease with increase in the grade of the mixture, this relationship holds true, as a rule, for mixtures of the same plant: food ratio when these are prepared as in present commercial practice. It is possible to prepare a 6–8–4 mixture from present-day materials that has less effect on the salt content of the soil solution than the 3–8–4 mixtures formerly used. The results indicate that danger of salt injury from typical present-day mixtures is less than that from mixtures formerly used, even when the nitrogen in the latter mixtures is applied to the crop in split applications."

First annual report of the Arizona fertilizer control office, year ending December 31, 1938, W. T. McGeorge, E. O. Foster, and R. D. Taylor (*Arizona Sta. Bul. 165* (*1939*), *pp. 14*).—The new (1937) Arizona fertilizer law is a registration and correct labeling law, and consumers are cautioned in this first fertilizer analysis report to purchase according to the analysis of the

fertilizer, since poor quality fertilizer may legally be sold if correctly labeled. Brief statements concerning fertilizers for Arizona soils and on the properties of fertilizer materials are included, together with analytical data.

AGRICULTURAL BOTANY

Plant biology: An outline of the principles underlying plant activity and structure, H. Godwin (*Cambridge, Eng.: Univ. Press, 1939, 3. ed., rev., pp. XI+308, figs. 83*).—A revision of the textbook previously noted (E. S. R., 68, p. 697).

Plant physiology: A textbook for colleges and universities, B. S. Meyer and D. B. Anderson (*New York: D. Van Nostrand Co., 1939, pp. X+696, figs. 151*).—According to the authors, this book was developed largely from the courses in plant physiology as taught at the Ohio State University and the University of North Carolina and should be readily adaptable to use with any introductory course in the subject based on prerequisites of general botany and general chemistry. An attempt has been made throughout to bring into bold relief the fundamental principles of plant physiology.

On the formation of anthocyanins in plants, W. K. H. Karstens (*Chron. Bot., 5 (1939), No. 1, pp. 11–13*).—A review of current hypotheses of anthocyanin formation with special reference to the author's own studies,[1] which led him to conclude that "(1) a photochemical reaction starts the chain of reactions involved in anthocyanin formation; (2) two oxidative processes take place; (3) the reactions take place while the substances involved in the process are bound to a substrate; (4) the pigment formation probably involves a monomolecular reaction; (5) this monomolecular reaction takes place during the liberation of the pigment from the substrate; (6) the pigment after leaving the substrate dissolves in the acid cell sap and forms stable products with the organic acids present."

The effect of oxidation-reduction potential on plant growth, N. J. Volk. (Ala. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 8, pp. 665–670, figs. 4*).—In order to determine the effect of redox potential within certain limits on plant growth when oxygen was not a limiting factor, 13 widely different crop plants were tested using sand cultures and constant flow nutrient solutions of different Eh but of constant nutrient values and in equilibrium with the air. In all the tests it is believed that Eh was the only variable present. Under such conditions the results indicated that for the plants used a change in Eh from ±525 to ±325 mv. did not affect plant growth. An Eh of 325 mv. is ±100–150 mv. below the lowest Eh reached by 48 arable Alabama soils tested (1937). Redox potentials below 325 mv. have not been studied by the method described.

Growth of wheat plants from dry and soaked irradiated grains, E. L. Johnson (*Plant Physiol., 14 (1939), No. 3, pp. 493–504, figs. 5*).—In the experiments reported the percentage of seedlings surviving in the groups receiving X-ray seed treatment dry with 1,000, 5,000, and 10,000 r-units, respectively, was as high as in the controls under otherwise similar environment. A dose of 20,000 r-units, however, reduced the number to less than half, and heavier doses applied to dry seeds caused the death of all seedlings within 3 weeks. Seeds soaked before irradiation were much more sensitive to injury than dry seeds, seedlings from grains treated with doses higher than 5,000 r-units all dying within 3 weeks. Tillers on 6-week-old seedlings from irradiated dry grains were more numerous in 1,000 and 5,000 r-units groups than in controls.

[1] Rec. Trav. Bot. Néerland., 36 (1939), No. 1, pp. 85–170, pl. 1, figs. 21.

At maturity, with the same doses, the tillering and height were both increased. In the 5,000 r-units group in these 2 tests the green weight of the plants also exceeded that of the controls. Dry grains treated with 10,000 r-units in 2 of the 3 tests increased the average height, tillering, percentage of tillers bearing heads, and green and dry weights. Seedlings from soaked grains made less growth in all respects than the controls, except that the 1,000 r-units group tillered more than the controls in 2 tests, and in the 5,000 r-units group in all 3 tests tillering was considerably increased.

Effects of cations and anions on protoplasmic elasticity, H. T. and R. T. NORTHEN. (Univ. Wyo.). (*Plant Physiol., 14 (1939), No. 3, pp. 539–547*).—Using *Spirogyra* filaments as the test organism, the univalent cations Li and Cs decreased protoplasmic elasticity while Na and K increased it. Of the divalent cations, the chemically related Ca, Sr, and Ba decreased it whereas the chemically related Gl, Mg, Zn, Cd, and Hg increased it. The closely related anions bromide, chloride, and iodide had little effect on elasticity, the sulfate, phosphate, fluoride, and chromate ions caused an increase, and the arsenate and nitrate ions a decrease. It is concluded from these data that the effect of an ion in decreasing protoplasmic elasticity is due to its chemical activity rather than to its valence. When filaments were immersed in mixtures of divalent cations, the result could not always be predicted from the behavior of the individual ion.

The chemical induction of genetic changes in fungi, C. THOM and R. A. STEINBERG. (U. S. D. A.). (*Natl. Acad. Sci. Proc., 25 (1939), No. 7, pp. 329–335*).—The sporadic occurrence of striking variations among black Aspergilli in nature raised the question as to whether they arise from internal or external causes. The possibility that such changes, few under field conditions, could be induced to increase in frequency by chemical treatment led to the studies here reported. A large number of dyes, biological stains, and other chemicals, including colchicine and phenanthrene derivatives, were tested in culture media against stable laboratory strains of *Aspergillus niger*, *A. amstelodami*, and *Penicillium caseicolum*, with little or no result. However, consistent and readily duplicated results were obtained with a mannitol-nitrite nutrient solution (formula given). Under the nitrite stimulation, the *A. niger* strain produced certain of the same types of variants in successive tests, each beginning with the unchanged stock culture and developing a series of morphological changes varying in fairly definite directions and similar to a series of organisms collected from the field. Consistently with the *A. niger* tests, the *A. amstelodami* strain was induced to reduction of certain phases and accentuation of others by the nitrite solution, but *P. caseicolum* failed to respond to any of the stimulants thus far applied. It is believed that these preliminary studies may give a clue to the origin of groups of strains stable enough to remain taxonomically separable for long periods in standard media, but in which spore characters are practically identical. Apparently, further work on similar lines might furnish means of interpreting other groups and of producing variations showing useful biochemical activity.

Movement of viruses, auxins, and chemical indicators in plants, A. S. CRAFTS. (Univ. Calif.). (*Bot. Rev., 5 (1939), No. 9, pp. 471–504*).—It is concluded from this critical review (over four pages of references) that though eventually solute transport may be adequately explained on the principles of hydraulics, our present knowledge is incomplete and the over-all functions are so complex as to evade control and analysis. A frank recognition of the complex interrelations of structure and function in translocation processes is essential to their comprehension. Obviously, many studies are needed to complete

our views on solute movement in plants, but until they are designed with full recognition of the functional variables and structural limitations involved, they may be largely in vain.

Root response to slash pine seedlings to indolebutyric acid, D. K. PLANK. (Univ. Fla.). (*Jour. Forestry, 37 (1939), No. 6, pp. 497, 498, fig. 1*).—Preliminary results indicated accelerated root growth on slash pine seedlings from indolebutyric acid treatment, the most noteworthy effect, one year afterwards, being the increased depth of the root system.

The wound hormones of plants.—II, The isolation of a crystalline active substance, J. ENGLISH, JR., J. BONNER, and A. J. HAAGEN-SMIT (*Natl. Acad. Sci. Proc., 25 (1939), No. 7, pp. 323–329*).—Continuing the series (E. S. R., 79, p. 460), the isolation from fresh bean plant material of a crystalline substance possessing typical wound hormone activity is described. This substance, a dibasic acid with analysis corresponding to $C_{11}H_{20}O_4$, is said to be capable of evoking renewed cell division and extension activity in mature parenchymatous cells of the mesocarp of the string bean pod.

Influence of certain amino acids and of nicotinic acid upon the nicotine content of tobacco leaves, R. F. DAWSON (*Plant Physiol., 14 (1939), No. 3, pp. 479–491*).—Tests of their influence on nicotine formation in excised tobacco shoots cultured in aqueous solutions by quantitative analyses of the leaf tissues for changes in nicotine content were made for *l*-proline, *d*-glutamic acid, *l*-pyrrolidonecarboxylic acid, nicotinic acid hydrochloride, sodium magnesium chlorophyllin, glycine, *d l*-α-amino-*n*-valeric acid, *d*-arginine monohydrochloride, *d*-glucose, and citric acid. In varying degree the first four substances gave evidence of possessing an effect on the nicotine content of the leaves, and insofar as they may be compared the effectiveness of all the tested substances paralleled their respective closeness to the molecular structure of the nicotine molecule. It was further shown by proper means that the analytical differences were probably due to increases in nicotine itself rather than to decomposition products of the substances supplied to the leaves.

Among the substances tested, *d*-glutamic acid appeared to possess a sparing action on dry weight loss of tobacco leaves during cut-stem culture in diffuse light and to increase greatly the water uptake and turgidity of these plants, these activities being independent of its effect on nicotine content. Nicotinic acid possessed an even more striking stimulus for growth, dry weight accumulation, and increased turgidity, but here this influence was associated in every case with an increase in nicotine content of the leaves.

Glycine in the nutrition of excised tomato roots, P. R. WHITE (*Plant Physiol., 14 (1939), No. 3, pp. 527–538, figs. 10*).—Analysis of the nine-amino-acid mixture earlier developed (E. S. R., 79, p. 25) as a constituent of the nutrient for cultivating excised tomato roots indicated that no single amino acid and none of a number of pairs were indispensable, and glycine alone proved capable of replacing the entire group. Neither the α-amino group, the carboxyl group, nor the acetate radical was effective when supplied in any of several related compounds. Since glycine is not present in many storage proteins and only in small amount in yeast, no conclusions as to the form in which amino acid may be supplied to the roots in the intact plant can be drawn from this result. A completely known and relatively simple nutrient now available for cultivating excised tomato roots contains 20 gm. sucrose, 100 mg. $Ca(NO_3)_2$, 35 mg. $MgSO_4$, 80 mg. KNO_3, 65 mg. KCl, 12.5 mg. potassium acid phosphate, 0.75 mg. KI, 2.5 mg. $Fe_2(SO_4)_3$, 4.4 mg. $MnSO_4$, 1.5 mg. $ZnSO_4$, 1.6 mg. boric acid, 3 mg. glycine, and 0.5 mg. thiamin per liter. This solution is said to be capable of supporting continued and probably unlimited growth of tomato roots.

Bio-ecology, F. E. CLEMENTS and V. E. SHELFORD (*New York: John Wiley & Sons; London: Chapman & Hall, 1939, pp. [VII]+425, figs. 85*).—The authors believe that the development of ecological science has been hindered in its organization and distorted in its growth by the separate development of its two categories—plant and animal ecology. In this book they attempt to correlate the two fields. The text is grouped under the headings of nature and relations of bio-ecology; community functions; reaction—the influence of community on habitat; coaction—the interrelation of organisms; aggregation, competition, and cycles; migration; climax and sere; the North American grassland—*Stipa-Antilocapra* biotic formation (Biome); aquatic climax communities; and marine biotic communities. An appendix dealing with general methods, a 36-page bibliography, and an index complete the work.

British ecology during the past quarter-century: The plant community and the ecosystem, A. G. TANSLEY (*Jour. Ecol., 27 (1939), No. 2, pp. 513–530*).—A review centering around the plant community and the ecosystem, the Breckland, the hydroseres, chalk grassland, British beechwoods, autecology, statistical analysis of distribution, pedology and edaphic factors, climate and vegetation, physiology of vegetation, work in nature reserves, animal and human ecology, and technic.

Fluctuations in the annual vegetation of California, M. W. TALBOT, H. H. BISWELL, and A. L. HORMAY. (U. S. D. A.). (*Ecology, 20 (1939), No. 3, pp. 394–402, figs. 4*).—The herbaceous vegetation of some 25,000,000 acres of California range lands is said to be dominated by annual plants, which constitute the vegetation of extensive valley and foothill grassland areas and form the ground cover under the more open woodland and chaparral types. Under the influence of such factors as arid climate and variable weather, livestock grazing, and other treatment this annual-plant cover undergoes changes that are both swift and erratic as compared with the more stable perennial associations. Since 1934 data on their occurrence and magnitude have been obtained in connection with the general program of range investigations, as they bear directly on livestock production and watershed management. Illustrative examples are here given relative to the extent and character of these annual-plant communities and to the fluctuations in composition and yield. Wide fluctuations in herbaceous vegetation hold more than academic interest, since they are directly related to uncertainties in forage supply and soil cover and complicate range and watershed management. Thus as a factor in practical land use they hold great economic interest.

A phytosociological analysis of a tupelo gum forest near Huntsville, Alabama, W. T. PENFOUND and T. F. HALL (*Ecology, 20 (1939), No. 3, pp. 358–364, figs. 3*).—An ecological study of the tree, shrub, vine, and herbaceous associations and other biotic factors in this swamp forest in which tupelo gum (*Nyssa aquatica*) is predominant.

Features of growth-control in trees, D. T. MACDOUGAL (*Amer. Phil. Soc. Proc., 81 (1939), No. 3, pp. 421–445, figs. 6*).—Defoliation and disbudding tests indicated that auxins promoting growth of cambium or secondary meristem and inhibiting growth of primary meristem in buds may originate in buds and leaves. Removal of terminal buds may be followed by cancellation of the inhibitory action of their products on laterals but by undisturbed cambial activity. Defoliation followed by some awakening of axillary buds had a very positive detrimental effect on wood formation by cambium. Simultaneous inception of growth throughout the length of tall trunks is believed to render untenable the theory that auxins or their activating effects are transmitted downward immediately after their origination in leaves and buds at the begin-

ning of the season. Actual translocation of auxins at rates up to 10 mm. per hour and their accumulation in or near the entire cambium sheet of trunks was indicated, but growth-promoting action may await the incidence of various favorable factors. Inception of cambial activity in trunks may precede growth in buds or dependent segments of twigs in some deciduous and evergreen trees. This accumulation of auxins may also result from upward movement of auxins, etc., originating in root sprouts which may activate and maintain cambium below girdled redwoods for at least 21 seasons. Apical growth and cambial thickening in roots may precede similar action in shoots or trunks by weeks or even months, or may occur in alternation, making it improbable that growth substances originating in stem terminals are concerned in root growth except in the basal sections. The flaring trunk bases and the basal regions of attached roots act as a unit in growth, enlargement being accelerated by the effects of wind flexion. Growth of primary generative cell masses in root and stem apexes and growth in secondary meristem may proceed independently, though mostly coincidentally. Elongation in both members begins before cambial action in most species, and generally ends with attendant closure of buds before cessation of cambial action. Activation of lateral buds in extension of branches consists in the awakening of primary meristem which is controlled by the inhibitory action of auxins from the terminal buds. Root laterals originate from initials in the pericycle and may appear in great numbers. Many features of growth sequence in large plants such as trees at the summit of the biological curve of development are said to be unexplainable by the results of tests of the action of plants in the juvenile stage as in seedlings, or in a regenerating condition as in cuttings.

The classification of life-forms of plants, R. S. Adamson (*Bot. Rev., 5 (1939), No. 10, pp. 546–561*).—The author presents a critical review (79 references) of the ecological rather than the systematic aspects of plant form. In many cases there is such a close relationship between the general grouping of plant forms and the environal conditions, repeated in separated geographical regions in which totally different floras are concerned, that it is believed impossible not to imagine some correlation, even if not a casual relationship. With present knowledge it seems impossible to make more than the most general outline of a scheme of classification on a basis of behavior correlated with form, but this basis appears to be an essential and one which gives the greatest possibility of arriving at a real understanding of the relationships involved. If a classification of life forms is to have more than mere descriptive utility it must be based on criteria of known physiological significance. The attainment of such a classification may be still far off, but it provides a goal for investigations.

Further studies of non-nuclear structures in the basidium, J. E. Sass. (Iowa State Col.). (*Iowa Acad. Sci. Proc., 45 (1938), pp. 99, 100*).—An abstract.

Some features in the life history of Amphicarpa bracteata (L.) Fernald (hog peanut), J. N. Martin. (Iowa State Col.). (*Iowa Acad. Sci. Proc., 45 (1938), pp. 75–88, figs. 9*).—The hog peanut is a cleistogamous legume chiefly of forests and open woodlands and with a range covering most of the United States east of the Rocky Mountains. The present study deals chiefly with its general morphological features and those of the flowers, fruits, and seeds, and with seed germination. In Iowa and other areas where the above-ground structures are killed each season by frost the only parts surviving the winter are the seeds and possibly portions of the subterranean branches where there is sufficient covering to afford protection. This plant is said to furnish a

considerable amount of food for birds, squirrels, and woods mice, and the beans were used by the Indians.

The American species of Crepis: Their interrelationships and distribution as affected by polyploidy and apomixis, E. B. BABCOCK and G. L. STEBBINS, JR. (*Carnegie Inst. Wash. Pub. 504* (*1938*), *pp.* [*3*]+*199*+*1*, *pls. 3*, *figs. 34*).—In this monograph the authors discuss the taxonomic history of the indigenous species; the present distribution, cytology, genetic interrelationships, distributional factors, and origin and development of the species; the effect of polyploidy and apomixis on evolution; and the systematic treatment of the agamic complex. A key to the western American species and descriptions of the genus and of 18 species follow. Indexes to species, subspecies, synonyms, and exsiccatae, and about three pages of bibliography are also included.

Proceedings of local branches of the Society of American Bacteriologists (*Jour. Bact.*, *38* (*1939*), *No. 2*, *pp. 232, 235, 237, 238, 246*).—Abstracts of the following papers are of interest to botany: The Influence of Certain Chemical Substances Upon the Growth of Legume Bacteria, by T. M. McCalla (Kans. State Col.); Heteroauxin Production by Root Nodule Bacteria, by C. E. Georgi (Univ. Nebr.); Dissimilation of Glucose by Members of the Genus *Bacillus*, by F. H. Gallagher and R. W. Stone (Pa. State Col.); The Effects of X-Rays on the Dissociative Rates of Certain Bacteria, by S. Haberman and L. D. Ellsworth (Ohio State Univ.); and A Method for Making Bacterial Counts in a Test Tube, by E. Redowitz.

The efficiency of the poured plate technique as applied to studying bacterial plant pathogens, A. J. RIKER and I. L. BALDWIN. (Wis. Expt. Sta.). (*Phytopathology*, *29* (*1939*), *No. 10*, *pp. 852–863*, *fig. 1*).—The ordinary poured-plate technic, while generally useful, is believed inadequate for critical bacteriological studies because many of the colonies develop from bacterial clumps, small colonies often coalesce, and practical experience has shown that pure cultures are not always thus secured. Various modifications of the method considered much better are discussed. Statistical estimates are given of the probability that colonies may coalesce as they grow which may have application to bacterial plate counts and to the local lesion method of studying viruses. Single-cell isolations give greater assurance of pure cultures than do even well-controlled dilution plates, but both methods have their advantages and may well supplement each other.

The decagon for vegetation studies, M. CULLEY. (U. S. D. A. and Univ. Ariz.). (*Jour. Forestry*, *37* (*1939*), *No. 6*, *pp. 492, 493*, *figs. 2*).—For determining the density of vegetation in range research the decagon frame is reported to have given the best results, especially where several kinds of plants make up the ground cover. The principle of this method is similar to that of the square-foot-density method of Stewart and Hutchings (E. S. R., 76, p. 468), except that the plats are the shape of a regular decagon instead of being round. The recording procedure and application of the method are described.

Equipment for the growing of plants at controlled temperatures, E. M. BROWN. (U. S. D. A. and Mo. Expt. Sta.). (*Plant Physiol.*, *14* (*1939*), *No. 3*, *pp. 517–526*, *figs. 7*).—The temperature control equipment described and illustrated consists of three growth chambers, the devices necessary for temperature regulation therein, and the greenhouse in which they are housed. Some features, particularly the use made of standard equipments, are believed to represent new developments in apparatus for the growing of plants at controlled temperatures. During the first year of operation mechanical failures have been infrequent and of minor nature, and because of the use of standard air-conditioning and refrigeration equipment local servicing is available and repair parts are readily obtained.

An apparatus made from glass for the continuous watering of pot cultures, E. B. OFFUTT, R. K. CALFEE, and J. S. McHARGUE. (Ky. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 8, pp. 725–728, figs. 4*).—An improvement of the apparatus previously reported (E. S. R., 78, p. 161), particularly applicable to studying the effects of minor elements.

An improved transfer hood, J. EHRLICH. (Univ. Idaho). (*Phytopathology, 29 (1939), No. 10, pp. 908, 909, fig. 1*).—In the hood described, the glass top slopes towards the operator. The rear is of glass, while the sides are of wood with glass doors and the front is of taut cloth with elbow-length sleeves elastic at the free ends. Rubber gaskets contact an enameled table top replacing a fixed bottom. Heated air escapes through glass wool in a passage near the top of each side, and a trough along the bottom of each front pane catches any water condensed during steaming. Electric showcase bulbs provide light.

Methods of tissue preparation for analysis in physiological studies with plants, T. C. BROYER. (Univ. Calif.). (*Bot. Rev., 5 (1939), No. 10, pp. 531–545*).—A critical review (about two pages of references) and evaluation is presented of the procedures that have been most widely employed in the treatment of plant tissues preceding chemical and physical analysis.

Chromosomes from leaves, J. T. BALDWIN, JR. (*Science, 90 (1939), No. 2332, p. 240, figs. 2*).—In working with plants from eight different families a modification of Warmke's method (E. S. R., 74, p. 611) for making root-tip smears was found to be effective for studying chromosomes in the leaves. Young leaves are placed in Carnoy's solution for 5 or more minutes, transferred momentarily to a solution of equal parts of 95 percent alcohol and concentrated HCl, put back into Carnoy's, and, after several minutes, smeared in iron acetocarmine.

GENETICS

An introduction to modern genetics, C. H. WADDINGTON (*London: George Allen & Unwin, 1939, pp. 441, pls. 5, figs. 160*).—An account is given of the principles and basic facts of genetics, with discussions and presentations of the more recent advances in the subject.

A century of research on the cell, L. ASCHOFF, E. KÜSTER, and W. J. SCHMIDT (*Hundert Jahre Zellforschung. Berlin: Borntraeger Bros., 1938, pp. X+285*).—The three main divisions of this monograph deal, respectively, with the development of the theory of the plant cell (Küster) and the animal cell with its present position and evaluation (Schmidt), and Virchow's cellular pathology (Aschoff).

Chromosome number in Indian linseed, Linum usitatissimum L., R. H. RICHHARIA and W. J. KALAMKAR (*Indian Jour. Agr. Sci., 9 (1939), No. 3, pp. 561–564, pl. 1*).—Examination of chromosomes of several flax varieties grown in the Central Provinces and Berar showed the diploid number to be 30 in root-tip cells. At late diakinesis and I metaphase 15 bivalents and at II metaphase 15 univalents were observed.

Grass studies.—III, Additional somatic chromosome complements, E. L. NIELSEN. (Univ. Ark.). (*Amer. Jour. Bot., 26 (1939), No. 6, pp. 366–372, figs. 33*).—A continuation of the investigation noted earlier (E. S. R., 78, p. 319), reporting the diploid chromosome numbers in 34 races belonging to 28 species of Gramineae.

Exchange of certain alternative stable characters in crosses between dent and flint corn, P. J. OLSON (*North Dakota Sta. Bul. 291 (1939), pp. 28, figs. 6*).—Crosses were made between flint corn, having a tillering habit and

husks terminating in a long blade, and dent corn, typically nontillering and husks with no blades or short ones. Segregation occurred in F_2 and backcross generations and in F_3 populations for different degrees of tillering and different lengths of husk blades. The backcross generation, F_1 by dent, showed a typical left-hand concentration, i. e., in the direction of low tiller number and short husk blades, and F_1 by flint, a concentration in the opposite direction. F_3 populations distinctly different in pattern were obtained from the various crosses, showing that segregation for different genic combinations determined different degrees or limits of tillering and husk blade length. The inheritance of number of rows on ears resembled that of tillers and husk blades. No populations were found that bred true for any particular row number, even for eight rows.

The inheritance of the combined characters, tillering and husk blades, was studied in a number of crosses, and the expected and observed results on the basis of independent inheritance and dominance of presence over absence were recorded for F_2 and two backcross generations. A multiple factor interpretation is offered to explain the inheritance, independently, of these two characters.

Among a total of nearly 5,000 F_2 and later plants in 1935, 38 reverse type A plants were recovered, i. e., without tillers or husk blades bearing true flint ears with from 8 to 12 rows of kernels; whereas nearly 200 reverse type B plants were found, i. e., with tillers and husk blades bearing dent ears with 12 or more rows of medium to rough dented kernels. A race breeding true for reverse type A was not established. "The assumption of multiple factors for the characters, tillering, husk blades, and kernel row number calls for the production of F_2 generations consisting of thousands of individuals in order to permit the recovery of the combination represented by reverse type A."

Heredity and environment, F. B. Hutt. (Cornell Univ.). (*Amer. Poultry Jour., 69 (1938), No. 12, pp. 4, 21–23, figs. 4*).—Examples of environmental influences on the expression of hereditary factors, principally in poultry, are cited.

High records contrasted with unselected records and with average records as a basis for selecting cows, J. C. Berry and J. L. Lush. (Iowa Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 8, pp. 607–617, figs. 3*).—A study was made of the correlations between records and groups of records of 115 Holstein cows, each of which had completed at least six Herd Improvement Registry lactations and had one or more daughters with at least two records. The authors conclude that the high correlation found between the cow's highest record and the average of the other records from which this was selected results from the statistical effects of the selection itself and does not indicate superiority of the highest record for predicting future production or breeding value. Correlations of the highest record with other records from which it was not selected indicated a similar reliability to unselected records but less reliability than the average of all unselected records. Averages appear more dependable for indicating differences between cows, notwithstanding the recommendations of Copeland (E. S. R., 80, p. 471).

Agnathia, a new bovine lethal, F. Ely, F. E. Hull, and H. B. Morrison. (Ky. Expt. Sta.). (*Jour. Hered., 30 (1939), No. 3, pp. 105–108, figs. 2*).—Four cases of agnathia in ♂ Jersey fetuses are described. Evidently the abnormal condition is inherited as a recessive, and it is assumed that its appearance is limited to ♂♂.

Inequalities in the digits in swine, J. E. Nordby. (Idaho Expt. Sta.). (*Jour. Hered., 30 (1939), No. 7, pp. 307–310, figs. 3*).—Study of the digits of swine of different breeds showed that there are relatively few cases in which the

members of the digit pairs are similar. The inside toe is usually shorter than the outside corresponding toe of a pair. There was much variation in the amount of inequality, but when pronounced it tended to cause lameness. A tendency to the condition seemed to be inherited, but reasonably normal sows and boars produced defective pigs.

Studies on the tricolor pattern of the guinea pig, I, II, H. B. Chase (*Genetics, 24 (1939), No. 4, pp. 610–621, figs. 9; pp. 622–643, figs. 9*).—Two papers are presented.

I. *The relations between different areas of the coat in respect to the presence of color.*—A study was made of the appearance of color and white patterns (E. S. R., 76, p. 775), giving special attention to the regularities underlying the apparent irregularities of spotted patterns and the interrelationships between the occurrence of color and white on different areas of the coats of inbred stocks. Regularity in the sequence in the extent of color from strains with little color to self-colored strains was noted. Although the level of the strain in amount of color was largely hereditary, there were minor differences in the localization of color as determined by the color of definite points in the coats. Nonhereditary factors in white spotting were judged by zero correlation coefficients between distant regions to act locally instead of on the animal as a whole.

II. *The distribution of black and yellow as affected by white spotting and by imperfect dominance in the tortoise shell series of alleles.*—Considering the multiple allelic series for extension of black, it was found that E was completely dominant over e^p and e, and e is completely recessive to e^p. The black-yellow pattern was recorded by the percentage of hairs of different colors. Segregated black and yellow were found to occur on the nose and feet, and yellow particularly tended to occupy positions most frequently white. Variations in the black-yellow pattern were more closely associated with the amount of white than with the genotype of the animal with respect to the spotting genes S and s.

A comparative analysis of the measurements of the limb bones of inbred families of guinea pigs and their hybrids as affected by family, sex, and age, O. N. Eaton. (U. S. D. A.). (*Amer. Jour. Anat., 64 (1939), No. 3, pp. 485–499*).—Determination of the weights and lengths of the leg bones of inbred, crossbred, and control families of guinea pigs showed that variability of the control stock (B) was significantly greater than of inbreds. F_1s between inbred families exceeded the parent races in the weights of specific bones. The bones of ♂♂ were significantly larger than those of ♀♀. The bone dimensions of the inbred families were surprisingly similar, considering body weight differences. There was remarkable uniformity between the sexes and the several families in the ratios between bone lengths. Variance analyses showed approximately 35 percent of the bone length variance and 23 percent of the bone weight variance to be hereditary.

The inheritance of taillessness (anury) in the house mouse.—II, Taillessness in a second balanced lethal line, L. C. Dunn and S. Gluecksohn-Schoenheimer (*Genetics, 24 (1939), No. 4, pp. 587–609*).—In continuation of this series,[a] further study is reported on the segregation of the multiple allels for taillessness in the house mouse (E. S. R., 78, p. 610). From matings of tailless ♀♀ from the true-breeding line to normal ♂♂, equal numbers of normal and brachy offspring were produced. However, the reciprocal cross, normal ♀ × tailless ♂, produced 647 normals, 85 brachy, and 8 tailless progeny. From this and several other crosses it was concluded that ♀♀ heterozygous for t^1 (Tt^1, $+t^1$, or t^1t^0) transmit t^1 to half their progeny, whereas similar heterozygous ♂♂ transmit

[a] Genetics, 21 (1936), No. 5, pp. 525–536.

the gene t^1 to many more than half of their progeny. The progeny inheriting t^1 tended to occur in clusters within single litters. The basis for the clustering phenomenon is discussed as being due to additional equational divisions in spermatogenesis and possible association of spermatozoa carrying the allel t^1. None of the matings showed crossing over between the genes T and t^1 and thereby tended to substantiate the allelic relation between these genes.

Time of death of lethal homozygotes in the T (brachyury) series of the mouse, S. Gluecksohn-Schoenheimer (*Soc. Expt. Biol. and Med. Proc., 39 (1938), No. 2, pp. 267, 268*).—A total of 40 litters with $+t^1$ dams and $+t^1$ sires were dissected out at 7, 8, 9, 10, and 11 days of gestation. There were among the young 275 normals and 19 abnormals. Since the abnormals were far below the 25 percent of t^1t^1 young expected and the litter sizes were small, it seems evident that the lethal action occurs before implantation. Study of the litters from mating of $+t^0 \times +t^0$ indicated that death of t^0t^0 individuals apparently occurs at the sixth day of development.

A study of the influence of line breeding and controlled mating on the livability of poultry, C. H. Bostian and R. S. Dearstyne (*North Carolina Sta. Rpt. 1938, pp. 60–62*).—Continuing previous work (E. S. R., 80, p. 86), data on the influence of mating from superior families on livability and the causes of mortality of pullets from the various matings are tabulated and discussed.

Sex ratios and comparative rearability of the sexes in the cross-breeding experiment (1934–7) at the Northern Breeding Station of the National Poultry Institute, Reaseheath, F. J. Dudley and W. L. S. Hindhaugh (*Jour. Genet., 37 (1939), No. 3, pp. 491–497, fig. 1*).—Among 6,030 chicks produced in purebred and reciprocal crossbred matings of Rhode Island Reds and White Leghorns, 51.8 percent were ♂♂. Pure White Leghorns were 55.2 percent and pure Rhode Island Reds 50.3 percent ♂♂. Rhode Island Red ♂♂ × White Leghorn ♀♀ produced 50.2 percent ♂♂, and the reciprocal cross produced 52 percent ♂♂. A tendency was noted for the proportion of ♂♂ to be slightly higher among the progeny of first-year breeders than in the progeny of older birds. Proportionately more ♀♀ than ♂♂ survived up to 16 weeks of age.

A pseudogynandromorph in the fowl, W. F. Lamoreux. (*Cornell Univ.*). (*Jour. Hered., 30 (1939), No. 3, pp. 78–80, figs. 2*).—Mature ♂ progeny from a Barred Plymouth Rock ♂ × Silver Spangled Hamburg ♀ were produced which showed both ♂ and ♀ feather structure as a result of hormone treatment. When the feathers were plucked from one side of the ♂♂ and Progynon-B was administered for 60 days, the newly developing feathers were of normal ♀ structure and barred throughout, whereas the feathers on the other side (on the hackle, saddle, and wing) were irregularly white and spangled.

On the measurement and inheritance of sexual maturity in turkeys (Meleagris gallopavo), V. S. Asmundson. (Univ. Calif.). (*Amer. Nat., 73 (1939), No. 747, pp. 365–374*).—A statistical analysis of trap-nest records of turkeys hatched between 1931 and 1937 showed that the date of first egg was a better measure of sexual maturity than age at first egg for birds hatched within the normal hatching season of almost 2 mo. Later-hatched birds usually started to lay at younger ages than those hatched earlier. By selection, early-maturing strains differed significantly in date of first egg from later-maturing strains. The operation of sex-linked factors was evident in that the progeny of late-maturing ♂♂ × early-maturing ♀♀ laid earlier than the birds in the late-maturing line but later than the progeny from the reciprocal crosses. Contrary results in which the progeny of an early-maturing ♂ and a late-maturing ♀ matured as early as the early-maturing line suggest that sexual

maturity in turkeys is determined as in fowls by both sex-linked autosomal genes.

The reproductive efficiency of dairy cattle, A. SPIELMAN and I. R. JONES. (Oreg. Expt. Sta.). (*Jour. Dairy Sci.*, *22* (*1939*), *No. 5*, *pp. 329–334*).—Results are reported on a study of the reproductive efficiency of groups of cows from four breeds in the college herd. Reproductive efficiency was indicated by the cows' approach to an optimum breeding record, which consisted of calving at 12-mo. intervals after attainment of a certain age dependent upon the breed. Breeds and cow groups made up of from 4 to 11 generations of ♀ progeny from 1 foundation cow differed significantly in their reproductive efficiency from other groups, even in the same breed. A correlation of 0.546±0.118 was found between the reproductive efficiency of the foundation cows and the reproductive efficiency of their ♀ descendants.

Hydrogen ion concentration changes in the vaginal fluid of the rat during an estrous cycle, J. S. BEILLY (*Endocrinology*, *25* (*1939*), *No. 2*, *pp. 275–277*, *figs. 4*).—Changes in the pH of the vaginal fluid of the rat were found to be associated with changes in the cytology in different stages of the oestrous cycle. In the ovariectomized animal, the pH was relatively constant at from 6.8 to 7.4, but fluctuated as in the recurring cycle after the administration of Progynon-B.

International standards for pregnancy urine gonadotrophin, mares' serum gonadotrophin, and certain anterior pituitary hormones, J. B. COLLIP (*Endocrinology*, *25* (*1939*), *No. 2*, *pp. 318–324*).—Editorial comment and an account of the progress made by the Third International Conference on the Standardization of Hormones in standardizing gonadotropic and pituitary principles are presented.

Survival, structure, and function of pituitary grafts in untreated rats and in rats injected with estrogen, D. PHELPS, E. T. ELLISON, and J. C. BURCH (*Endocrinology*, *25* (*1939*), *No. 2*, *pp. 227–235*, *figs. 13*).—Pituitaries from mature ♂ and ♀ rats were grafted into the thigh muscles of mature ♀♀. Daily injections of 200 rat units of oestrogen favored the survival of the grafts. Grafts from ♀ donors survived better than those from ♂ donors. The grafts seemed to exhibit some but little activity. Evidently oestrogen directly stimulates the pituitary without direct nerve stimulus.

The relation of the pituitary to blood lipids, O. B. HOUCHIN and C. W. TURNER. (Mo. Expt. Sta.). (*Endocrinology*, *24* (*1939*), *No. 5*, *pp. 638–644*, *fig. 1*).—Although there was considerable variability between rabbits in the amount of plasma fat determined, intraperitoneal injections of 300 mg. of an anterior-pituitary extract were found to lower the fat content of the blood plasma of individual rabbits an average of about 36 percent within 6 or 8 hr., followed by a return to normal within 24 hr. Tests of the effects of fractions of this extract and hormones from the adrenal, thyroid, and other glands indicated that the fat-metabolism hormone was responsible for this action of the pituitary extract.

Seasonal variations in the gonadotropic hormone content of the rabbit pituitary, M. H. and G. S. FRIEDMAN (*Endocrinology*, *24* (*1939*), *No. 5*, *pp. 626–630*, *figs. 2*).—The gonadotropic content of the rabbit pituitary drops sharply during the 24-hr. period following mating, but the hormone in the gland increases gradually during the subsequent pseudopregnancy. Although the shape of the curve was found to be unaltered in different seasons, the height of the curve shifted, being highest in the spring and lowest in early January. Light was the only factor which gave any indication of being responsible for the seasonal differences.

A method of assay for the fat-metabolism hormone of the anterior pituitary, O. B. HOUCHIN and C. W. TURNER. (Mo. Expt. Sta.). (*Endocrinology, 25 (1939), No. 2, pp. 216–220*).—It was found that the plasma fat of healthy ♀ guinea pigs was depressed in proportion to the amount of anterior-pituitary fat-metabolism hormone injected. Determinations at intervals up to 26 hr. showed that the maximum depression occurred about 6 hr. after injection.

The assay of gonadotropic extracts in the post-partum rabbit, M. H. FRIEDMAN (*Endocrinology, 24 (1939), No. 5, pp. 617–625, fig. 1*).—By the use of the post-partum rabbit instead of the isolated rabbit, gonadotropic assays were more directly related to body weight. Because of the reduced variation, smaller numbers of animals were needed to give increased accuracy to the findings.

Comparative studies of gonadotropic hormones.—VI, Some effects of long-continued daily injections, C. F. FLUHMANN (*Endocrinology, 25 (1939), No. 2, pp. 193–198, figs. 7*).—Continuing this series (E. S. R., 78, p. 617), the administration of sheep anterior-pituitary extract, extract of blood from pregnant women (chorionic), and pregnant-mare serum for periods up to 1 yr. to ♀ rats 21 days old at the start of the experiment showed that these substances had considerably different effects on the ovaries, uteri, and pituitaries. With the sheep pituitary extract, the ovaries reached a maximum weight in about 100 days and subsequently became atrophic. There was some increase in the uterus and the anterior lobe. The chorionic hormone caused a pronounced and lasting increase in the size of the ovaries and uterus, with some regression in ovary size after 272 days. Injection of pregnant-mare serum for 123 days yielded ovaries scarcely larger than those of control rats, but in proportion to the size of the ovaries the uteri showed more enlargement than resulted from the two other hormones.

The termination of pregnancy of dogs by gonadotropic antihormone, K. W. THOMPSON (*Endocrinology, 24 (1939), No. 5, pp. 613–616*).—Intravenous injections of serum from a dog which had received gonadotropic hormone for 3.5 yr. initiated abortions in 12 dogs within from 48 to 100 hr. following the first injection. Injections were repeated at daily or semidaily intervals.

Nature of the action of testosterone on genital tract of the immature female rat, I. T. NATHANSON, C. C. FRANSEEN, and A. R. SWEENEY, JR. (*Soc. Expt. Biol. and Med. Proc., 39 (1938), No. 2, pp. 385–388*).—The results of several experiments showed that the administration of a single dose of from 2.5 to 10 mg. of testosterone propionate to immature ♀ rats caused vaginal opening and growth of the uterus and vaginal epithelium in normal, ovariectomized, and hypophysectomized animals. Evidently testosterone acts directly on the uterus and vaginal epithelium. Ovaries were stimulated only through the intact pituitaries. Tubal epithelium was slightly stimulated only in the presence of corpora lutea.

Effect of local application of testosterone in an ointment on growth of penis in the rat, R. R. GREENE and H. S. WIGODSKY (*Soc. Expt. Biol. and Med. Proc., 39 (1938), No. 2, pp. 307–310*).—Daily local application for 22 days of 75γ of testosterone to the penes of 24-day-old castrated rats caused growth of this organ equivalent to that in untreated normals.

The inhibition of comb growth in cockerels and capons by estrone, W. H. HOSKINS and F. C. KOCH (*Endocrinology, 25 (1939), No. 2, pp. 266–274, fig. 1*).—Intramuscular injections of 0.5 mg. of oestrone daily for 1 or 2 weeks caused a temporary shrinkage in the comb and testis weight of Single Comb White Leghorn cockerels. The comb size of incompletely castrated cockerels was also reduced. Oestrone alone in capons gave no comb growth, whereas

0.1 mg. of androsterone produced 4.1 mm. of growth in 5 days. The administration of oestrone with androsterone reduced the amount of comb growth obtained in capons. The antagonistic action makes necessary the separation of the two hormones in comb-growth assays.

The reciprocal nature of the testis-comb relationship, W. H. Hoskins and F. C. Koch (*Endocrinology, 25 (1939), No. 2, pp. 257–265*).—Feeding comb tissue to rats, cockerels, and capons had no consistent effect on the size of the testes or secondary sexual glands. Extracts of comb tissue injected into rats slowed body growth and decreased the size of the secondary sex glands, but the extracted tissue had no such effects. Comb removal in cockerels did not influence testis size after 3 mo., but testes were significantly larger and heavier 7 mo. after comb removal.

Occurrence of positive vaginal smears in spayed mice, I. H. Perry. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc., 39 (1938), No. 2, pp. 344–346*).—Vaginal smears of spayed mice showed that occasional definitely positive smears developed, but their significance and the stimuli to which this response developed are unknown.

Adrenalectomy and coitus-induced ovulation in the rabbit and cat, H. B. Friedgood (*Endocrinology, 25 (1939), No. 2, pp. 296–301*).—Rabbits were found to ovulate after mating whether or not they were adrenalectomized soon after mating. On the other hand, ovulation after coitus seemed to be generally prevented in cats by adrenalectomy or by most abdominal operations.

Cytology of the reproductive tract of the female bat Myotis lucifugus lucifugus, E. M. Reeder. (Univ. Mo.). (*Jour. Morphol., 64 (1939), No. 3, pp. 431–453, pls. 2, figs. 4*).—Histological study was made of the condition of the epithelium in different portions of the reproductive tracts of 52 bats collected between October and August. Ovulation was induced in others by injections of hypophyseal extracts.

An intrafollicular ovum laid by a fowl, F. B. Hutt. (Cornell Univ.). (*Poultry Sci., 18 (1939), No. 4, pp. 276–278, fig. 1*).—An account is given of an unruptured ovarian follicle containing a fully formed yolk which was laid without covering envelopes except a thin film of albumen.

Pseudopregnancies from electrical stimulation of the cervix in the diestrum, R. O. Greep and F. L. Hisaw (*Soc. Expt. Biol. and Med. Proc., 39 (1938), No. 2, pp. 359, 360*).—By electrical stimulation of the cervices of virgin rats on the first or second day of dioestrus, pseudopregnancy was induced in 76 percent of the ♀♀ treated, as compared with 86 percent of pseudopregnancy in ♀♀ stimulated in the late pro-oestrous and oestrous periods. However, electrical stimulation during pseudopregnancy did not prolong the duration of pseudopregnancy.

A study of the mammalian sperm cell.—I, Variations in the glycolytic power of spermatozoa and their relation to motility and its duration, R. E. Comstock. (Minn. Expt. Sta.). (*Jour. Expt. Zool., 81 (1939), No. 1, pp. 147–164, fig. 1*).—The glycolytic power of ram semen was measured by decreases in the reducing sugar brought about during a standard incubation period and by carbon dioxide production during a definite time at room temperature. The results of several tests showed that 76 percent of the variation in the duration of motility of fresh sperm was associated with variations in the glycolytic power of the semen. As sperm aged, the glycolytic power decreased.

Density of suspension and morphology of sperm in relation to fertility in the fowl, F. R. Sampson and D. C. Warren. (Kans. Expt. Sta.). (*Poultry Sci., 18 (1939), No. 4, pp. 301–307, fig. 1*).—Comparative densities of sperm in 2 samples of semen from each of 69 ♂♂ from various breeds showed almost as

much difference between the 2 samples from some ♂♂ as between different ♂♂. Artificial insemination tests with semen from a few of the birds indicated that variations in sperm counts bore no direct relation to fertility, but in natural matings a decline in density was noted in the birds with lowest fertility. Only 1 sterile ♂ among 86 showed a high percentage of abnormal sperm. Other ♂♂ showed variable morphological defects, and 1 ♂ which was sterile in normal matings had morphologically normal sperm and proved fertile in artificial insemination.

The present status of artificial insemination, C. L. COLE (*Michigan Sta. Quart. Bul., 22 (1939), No. 1, pp. 18–20*).—An account is given of the application, possibilities, and limitations in the practice of artificial insemination in livestock-breeding operations.

Artificial insemination in livestock, F. F. MCKENZIE. (Mo. Expt. Sta. and U. S. D. A.). (*Cattleman, 26 (1939), No. 4, pp. 52, 53, 56–58, figs. 7*).—Brief descriptions are given of the success attained in the practice of artificial insemination of livestock.

Sex identification of Barred Plymouth Rock baby chicks by down, shank, and beak characteristics, J. P. QUINN and C. W. KNOX. (U. S. D. A.). (*Poultry Sci., 18 (1939), No. 4, pp. 259–264*).—Barred Plymouth Rock chicks from the broiler and exhibition classes at the Northeastern Poultry Producers Exposition were separated for sex by the intensity of the black pigment in the down color and shank color with an accuracy of 83.5 and 86.1 percent, respectively. Beak pigment proved relatively unimportant for this purpose. Hatchery chicks from six flocks were sexed with an accuracy of 91.8 percent. In sexing chicks, ♂♂ were silver gray, silver black, or dull black on the back, with yellow toes. ♀♀ were a deep, brilliant black on the back and head, with black or dark toes.

Sex identification in hybrid chicks from Barred Plymouth Rock male × Rhode Island Red female, J. P. QUINN and C. W. KNOX. (U. S. D. A.). (*Poultry Sci., 18 (1939), No. 4, pp. 265–267*).—Since shank color characteristics were found to offer little accuracy in sexing 1,105 F_1 chicks (Barred Plymouth Rock ♂ × Rhode Island Red ♀), they were classified into four groups by size of the white head spot and by brownish heads. Those with the largest amount of white were predominantly ♀♀. The silver-striped chicks in the groups with head spots were 79 percent ♀♀, and 90.7 percent of the chicks with brown heads were ♂♂. There was a preponderance of ♂♂ among the chicks having the least white in the down.

FIELD CROPS

[Field crops work in North Carolina, 1938], C. B. WILLIAMS, E. R. COLLINS, J. J. SKINNER, [G. A. CUMINGS], P. H. KIME, R. H. TILLEY, J. H. MOORE, W. H. RANKIN, G. K. MIDDLETON, P. H. HARVEY, W. H. CHAPMAN, N. E. RIGLER, R. L. LOVVORN, W. W. WOODHOUSE, M. E. GARDNER, R. SCHMIDT, and E. H. HOSTETLER. (Partly coop. U. S. D. A.). (*North Carolina Sta. Rpt. 1938, pp. 22, 28–30, 30–34, 35, 36, 39–41, 49, 50, 79, 80*).—Agronomic activities again (E. S. R., 80, p. 36) reported on from the station and substations included variety tests with cotton, corn, barley, wheat, oats, soybeans, peanuts, and pasture grasses; breeding work with cotton, corn, wheat, oats, barley, peanuts, potatoes, sweetpotatoes, and soybeans; inheritance studies with cotton; environmental factors affecting the establishing of permanent pastures in the Coastal Plain area; effects of certain dusts and sprays, fertilizer, and spacings on growth, yield, and quality of peanuts; tobacco fertilizer investigations; fertilizer experiments with cotton, involving split applications with ammoniated phosphate, and placement studies; cotton fiber research dealing with effects of source of seed,

influence of potash deficiency upon yield and quality; physical properties of lint of improved varieties, and origin and early stages of elongation in the fiber; effect of stands and field uniformity on cotton yields; fertilizer needs of corn, wheat, and soybeans in rotation, and the form and rate of lime for corn on muck soil; yields and quality of different field crops when grown in variously fertilized and limed rotations on several soil types; rotations in which the legumes are variously cut for hay, seed harvested, or the crop left on the land; effects of crops on succeeding crops; crotalaria-corn rotations; and the utilization of crops grown in rotation with cotton by two different methods.

Small grain varieties for northern Arizona, A. T. Bartel and I. A. Briggs. (Coop. U. S. D. A.). (*Arizona Sta. Bul. 166 (1939), pp. 15–35, figs. 9*).—Variety trials were made with wheat, oats, and barley, 1931-37, at elevations exceeding 6,900 ft. Highest yielders in tests in the Springerville-Nutrioso area, with one irrigation in June at the jointing stage, were Hope wheat, Trebi barley, and Markton oats; and in the Flagstaff area under dry farming Reliance wheat (although under Irwin Dicklow and Kubanka, 1936-37), Union Beardless barley, and Markton oats.

Reseeding range lands of the Intermountain region, G. Stewart, R. H. Walker, and R. Price (*U. S. Dept. Agr., Farmers' Bul. 1823 (1939), pp. [2]+25, figs. 12*).—The possibilities of range reseeding are described with guides in choosing areas and determining what grasses and legumes to sow in high mountains and on lower slopes, directions on source of seed, methods of planting and caring for seeded areas, and remarks on costs of seed, labor, and protection.

The effect of intensity and frequency of clipping on density and yield of black grama and tobosa grass, R. H. Canfield (*U. S. Dept. Agr., Tech. Bul. 681 (1939), pp. 32, figs. 9*).—Responses of black grama (*Bouteloua eriopoda*) and tobosa grass (*Hilaria mutica*) to controlled harvesting by clipping were studied, 1925–35, on the Jornada Experimental Range in southern New Mexico. Black grama was clipped at 1- and 2-in. heights at 2-, 4-, and 6-week intervals during growth and tobosa grass at 2- and 4-in. heights at 1-, 2-, and 4-week intervals during growth, and both grasses at the end of the season.

Persistent cropping of all herbage of black grama (E. S. R., 81, p. 39) grass to a 2-in. height or less was shown to result eventually in destructive reduction of tuft area regardless of frequency of seasonal harvesting, to reduce forage yield to zero, to prevent survival and even establishment of reproduction of the forage grass, and to entirely outweigh beneficial effects of above-average rainfall. The end result is rapid and critical deterioration of the black grama site through excessive wind and water erosion. The persistent grazing by cattle, during or even at the end of the grazing season, of all stems of black grama in pure stands on semidesert sandy ranges down to 2 in. or less will practically destroy the black grama stand in a period of 10 yr., and can be expected to reduce the forage yield by one-half in 3 or 4 yr. and practically to zero in 8 or 9 yr.

Somewhat different results were produced in the tests with tobosa grass, of which the forage value disappears with maturity. Indications were that clipping first induces an expansion of tuft area, but the rate and extent of expansion depend on clipping frequency, and the permanency of increases in tuft area is governed by its closeness. Cropping all herbage to 2 in. represents greater utilization than tobosa grass can withstand, but clipping to 4 in. encourages growth of tuft area, maintains a high yield of valuable forage, and stimulates vegetative reproduction. Successive seasons of frequent grazing of all herbage of tobosa grass to a height of 2 in. will in a few years result in evidence

of overutilization in decline of tuft area, loss of plant vigor, and invasion of unpalatable weeds. Tobosa grass areas cropped as often as once each week have produced the highest quality of forage.

Malting quality of Canadian barleys.—II, Nineteen varieties, 1936 and 1937 trials, W. O. S. Meredith, H. Rowland, and J. A. Anderson (*Sci. Agr.*, *19* (*1939*), *No. 6, pp. 389–403, fig. 1*).—Further malting studies (E. S. R., 78, p. 186) dealt with 19 barley varieties grown in many localities in the prairie provinces of Alberta, Manitoba, and Saskatchewan.

Germination of carpet grass seed, E. H. and V. K. Toole. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, *31* (*1939*), *No. 6, pp. 566, 567*).—Seed of carpet grass (*Axonopus affinis*) of the 1935 crop, received soon after harvest, maintained good germination over a 3-yr. period, but 1934 crop seed, injured in previous storage, fell markedly in germination. Germination at a daily temperature alternation of from 20° to 35° C. gave comparable results with or without exposure to daylight and with or without use of dilute potassium nitrate solution to moisten the substratum. Other temperature alternations and all constant temperatures used gave lower germination.

Strawberry clover, E. A. Hollowell (*U. S. Dept. Agr. Leaflet 176* (*1939*), *pp. 8, figs. 3*).—Practical information is given on the characteristics, origin, adaptation, cultural needs, uses, and seed production of strawberry clover (*Trifolium fragiferum*), a perennial pasture legume tolerant to seeped, saline, and alkaline soils containing concentrations of salts that inhibit growth of most crop plants.

Station tests indicate definite place for corn hybrids on Colorado irrigated farms, W. H. Leonard and H. Fauber. (Coop. U. S. D. A.). (*Colo. Farm Bul.* [*Colorado Sta.*], *1* (*1939*), *No. 2, pp. 3–6, fig. 1*).—Yield tests, 1937–38, suggest Minhybrids 301 and 403 and Wisconsin 570 for conditions like those at Fort Collins and Funk G–19 for slightly lower, warmer areas in northeastern Colorado. Funk Hybrid 212 and Iowealth Hybrid AQ are recommended for irrigated conditions for altitudes below 4,500 ft. where the frost-free season averages 145 days or longer, particularly in the Arkansas Valley and the western slope in the Grand Junction area. Fort Lewis Selection and Animas Valley Flint outyielded all hybrids tested in 1938 at Fort Lewis (elevation 7,500 ft.).

Identification of Standard and Fairway strains of crested wheatgrass, W. D. Hay. (Mont. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, *31* (*1939*), *No. 7, pp. 620–624, figs. 4*).—Differences in size, weight, shape, percentage of awned seeds, and enclosure of the palea by the lemma made it possible to distinguish Standard and Fairway crested wheatgrasses and determine the approximate percentage of each in mixtures of seed. In the seedling stage, the two pure strains were identified by presence or absence of leaf hairs, hairs on the leaf sheath edges, and auricles. In field plantings the two strains were most easily distinguished just before blooming when differences in size and shape of spikes and variations in height and color of Standard plants were most pronounced as contrasted with greater uniformity of Fairway.

The potato: Characters and varietal descriptions, R. Diehl (*La Pomme de terre: Caractères et description des variétés. Paris: Impr. Natl., 1938, pp. [5]+157, [pls.] 65, figs. [13]*).—Varieties of potatoes grown most extensively in France are described and many are illustrated in color. Determinative keys group the varieties according to tubers and sprout characters and also according to plant, leaf, and flower characters. The several characters used in classification, e. g., tubers, sprouts, vegetation, earliness, quality, resistance to diseases, and cultural adaptations, are discussed in some detail.

Potato breeding investigations in 1938: Review of literature, C. F. Clark. (U. S. D. A.). (*Amer. Potato Jour., 16 (1939), No. 8, pp. 212–220*).—This review of potato breeding research, largely published in 1938, includes 31 references.

The Red Warba potato, F. A. Krantz and A. G. Tolaas. (Minn. Expt. Sta.). (*Amer. Potato Jour., 16 (1939), No. 7, pp. 185–190, figs. 2*).—Red Warba, a red periderm variety derived from the progeny of a tuber observed in 1933 among Warba potatoes by A. Nelson, was found to be a periclinal chimera with inner tissue identical with that of Warba. The new variety and its development are described. Since release to growers in 1936, production has increased to the point where carlot shipments were expected in 1939. Red Warba is considered desirable as an extra early, productive red potato for home or market.

Relation of length of day to flower and seed production in potato varieties, A. E. Clarke and P. M. Lombard. (U. S. D. A.). (*Amer. Potato Jour., 16 (1939), No. 9, pp. 236–244, fig. 1*).—Length of day was found to be an important factor in production of mature flowers and seed balls by different varieties of potatoes under greenhouse conditions at Beltsville, Md. Differences were observed between varieties in mean weight of seed ball, weight of seed for each fruit, and in light requirements for production of flowers and seed balls. More flowers were produced with the longer photoperiods, accounting for the increase in number of seed balls. In general, satisfactory conditions for both flowering and fruiting at Beltsville apparently are provided by a day length of about 16 hr.

A study of high and low levels of soil fertility response to two varieties of sugar beets, L. A. Hurst, A. W. Skuderna, and C. W. Doxtator. (Coop. U. S. D. A. et al.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 7, pp. 649–652*).—When two domestic varieties of sugar beets were compared at Rocky Ford, Colo., in reaction to different fertilizers and rates of application. 400 and 600 lb. per acre of fertilizer lowered performance with the "sugar" variety insignificantly as compared with 200 lb. With the "tonnage" variety, 400 and 600 lb. slightly increased yields, sugar percentage, and sugar per acre, although only the 600-lb. rate produced significant differences. The feeding ability of the variety evidently may be important in a breeding and improvement program.

Some morphological characters of Helianthus annus L., and their relationship to the yield of seed and soil, A. M. Ross (*Sci. Agr., 19 (1939), No. 6, pp. 372–379*).—Study of inbred strains of sunflowers revealed positive correlations between percentage of oil in the seed and height of plants (0.448) and between oil percentage and seed yield (0.32). There were observed a negative correlation between seed yield and the number of leaves, a positive correlation between seed yield and plant height, and also negative correlations between the seed yield and factors for number of branches, number of days from seeding to blooming, and number of heads, all significant. In a sunflower breeding project aimed at a high seed-yielding variety of high oil content, the taller nonbranching types deserve special consideration as basic breeding material.

Tobacco fertilizer recommendations for 1940, C. B. Williams et al. (Coop. U. S. D. A. and Va., S. C., Fla., Ga., and Tenn. Expt. Stas.). (*North Carolina Sta. Agron. Inform. Cir. 119 (1939), pp. [2]+4*).—Formulas, acre rates, and plant food sources are again recommended for fertilizers for flue-cured, sun-cured, and shipping tobacco, and for plant beds on tobacco soils in Virginia, North Carolina, South Carolina, Georgia, and Florida.

Quality of wheat varieties grown in Oklahoma in 1938, F. T. Dines (*Oklahoma Sta. Cir. 85 (1939), pp. 15, figs. 3*).—Milling and baking tests by cooperating laboratories in Oklahoma and Kansas made on samples from the 1937–38 wheat crop roughly grouped the varieties tested as follows: Tenmarq

and Turkey as of excellent quality; Blackhull, Cheyenne, Eagle Chief, and Smoothhead intermediate to good quality; and Chiefkan, Early Blackhull, Sibley 81, and Super-hard Blackhull as poor in quality. Although these conclusions are based on wheat samples grown in only 1 yr., they are said to agree with conclusions from similar studies made over a period of years in other States where hard red winter wheat is grown.

Montana Seed Law (as amended 1939), J. T. Sparling and W. O. Whitcomb (*Montana Sta. Cir. 155 (1939), pp. 13*).—The text of the Montana Seed Law as amended in 1939 is included with rules and regulations and also regulations for seed testing by the Montana Grain Inspection Laboratory.

Experiments on the control of European bindweed (Convolvulus arvensis L.), A. L. Bakke (*Iowa Sta. Res. Bul. 259 (1939), pp. 365–440, figs. 11*).—The effectiveness of a number of chemicals and cultural practices in control and extermination of bindweed are reported, with observations on its distribution and spread, botanical characteristics, and plant development.

European bindweed, the most serious weed in Iowa, has become well established in the western half of the State during the last 15 yr. It emerges from the ground late in April and attains most profuse growth and blooming in late June and early July. The root system may penetrate to 20 ft. deep and many secondary roots are developed in the upper 18 in. The seeds live in the soil for several years, and many unripened seeds may germinate. Mature seeds treated with 75 percent sulfuric acid or scarified germinated readily.

Sodium chlorate, proved to be the most effective herbicide, usually is applied 1 lb. per gallon of water. Addition of 4 gm. of powdered animal glue and 3 cc. concentrated sulfuric acid improved herbicidal action. Atlacide made before 1932 generally did not give as good results as sodium chlorate. Climatic conditions had much to do with the effectiveness of sodium chlorate; when there was enough humidity to produce dew at night, the results from spraying were good. Three sprayings of either sodium chlorate or Atlacide gave complete eradication of bindweed in one season. Spraying in June, August, September, and October gave good results. Plants which come up the second year evidently should be sprayed twice during the season or otherwise exterminated. Indications were that sodium chlorate should be sprayed when there is a heavy development of leaf surface; it killed heavy infestations as easily as light infestations. The chlorate gave best results on bindweed growing in small grain or with a smother crop such as millet. Plowing and seeding an infested area to winter rye, spraying the first time in early July of the following summer and again in early September, gave consistent results.

Sodium chlorate in solution gave more consistent results than when applied on the soil as a dry salt, which was more effective when placed in the soil. Potassium chlorate was about as effective as sodium chlorate. Ammonium thiocyanate in quantities of from 8 to 12 lb. per square rod applied in 1 yr. was also promising for small areas. Sulfuric acid, C. K. (creosote-kerosene) 10–90 spray, and salt (sodium chloride) had definite limitations, and several other chemicals were of little value.

Winter rye followed by alfalfa sown in August suppressed bindweed effectively, and soybeans, millet, cane, and Sudan grass were valuable smother crops. An infested field in small grain should be plowed at once after harvest and seeded to a smother crop if there is enough moisture. Otherwise the land should be fallowed the remainder of the year, preferably by shallow cultivations twice a week. One sodium chlorate spray in late fall followed by fallowing in spring to June 15 and then planting a smother crop and 2 yr. of spring

fallowing followed by soybeans drilled 2 bu. per acre for 2 yr. reduced bindweeds. Alfalfa, the best competitive crop and found tolerant to residual sodium chlorate, should be sown in late August. Sweetclover, as tolerant as alfalfa, was not so efficient a smother crop. Soybeans, more sensitive than oats, barley, and corn to chlorate residues in the soil, could not be used as a follow-up crop on treated ground.

Fallowing for 2 yr. with a spring-toothed harrow June 1 to October 1 did not eliminate all bindweeds, and surface cultivation of infested corn, like intensive pasturing with sheep and hogs, was ineffective.

Progress of bindweed eradication, T. F. Yost. (Partly coop. Kans. Expt. Sta.). (*Kans. State Bd. Agr. [Quart.] Rpt., 58 (1939), No. 230B, pp. 40, figs. 15*).—Report is made on progress during the first year of the program (E. S. R., 80, p. 619), including results of cooperative determination of effects of bindweed on crop yields and soil moisture, rate and locations of spread, and control by cultivation and chemicals, particularly sodium chlorate.

Prickly pear eradication and control, W. H. Dameron and H. P. Smith (*Texas Sta. Bul. 575 (1939), pp. 55, figs. 29*).—Experiments on the eradication of pricklypear (*Opuntia* spp.), conducted 1933–37 on the Edwards Plateau largely at the Ranch (Sonora) Substation, showed that grubbing (which includes piling) and poisoning are the most economical methods of eradication. Costs of grubbing ranged from 25 ct. to $3 an acre and of poisoning from 25 ct. for lightly infested areas to $2.50 or $3 for heavily infested areas. Neither singeing off the spines and then grazing nor injury from insects and diseases could be considered as eradication methods because they do not destroy the cactus completely.

The poison found most effective consists of a solution of 3 lb. of arsenic pentoxide (from 96 to 98 percent pure) in 1 gal. of water, to which is added 1 pt. of commercial sulfuric acid, best sprayed on both sides of the slabs and the terminal joints in a fine, foglike mist. Best results have been obtained when poisoning is done during the hot summer months. Good results can be obtained in May and October by careful application of the poison. A special atomizer using from 110 to 120 lb. of air pressure is used in applying the poisons. A metal alloy of 18 percent chromium, 8 percent nickel, and not over 0.07 percent carbon, generally termed 18–8–S stainless steel, was found to resist the action of pricklypear poison enough for use as sprayer or atomizer tanks.

Buried red rice seed, W. L. Goss and E. Brown. (U. S. D. A. et al.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 7, pp. 633–637*).—Five samples of red rice and two of cultivated white rice were buried at Stuttgart, Ark., Beaumont, Tex., and at Biggs, Calif., in the autumn of 1930. Sets from irrigated and nonirrigated lots were tested for germination in the spring of 1931, 1932, 1933, 1935, and 1937. Under dry storage at soil temperature conditions existing in California, the red rices showed good vitality after three winters. Cultivated white rices, especially Caloro, showed loss of vitality in the third year, and when buried in the soil at ordinary plowing depth lost vitality during the first winter. Italian red rice retained vitality longer than California white-awned, particularly under dry conditions. Both resembled cultivated rices in behavior but were slightly more persistent. In general, the seed kept alive longer in irrigated than in nonirrigated soil. Southern red rices showed good vitality after 3 yr. in the soil and some germination after 7 yr., apparently persisting longer in Texas and Arkansas than under California conditions. It was evident that clean culture during a short rotation will not rid the land of red rice.

HORTICULTURE

[Horticultural investigations by the Mississippi Station] (*Miss. Farm Res. [Mississippi Sta.], 2 (1939), No. 8, pp. 1, 2, 7, figs. 2*).—Included are these articles, all of a general nature: Good Gardens During Cool Weather Months if Requirements Met, by L. R. Farish; Summer Budding of Pecans, by S. J. Greer; and Lettuce Culture Successful for Careful Gardeners, by L. R. Farish.

[Horticultural studies by the North Carolina Station], M. E. GARDNER, I. D. JONES, C. F. WILLIAMS, O. VEERHOFF, C. E. VAN DEMAN, E. B. MORROW, E. R. COLLINS, N. E. RIGLER, J. J. SKINNER, R. A. LINEBERRY, R. SCHMIDT, G. O. RANDALL, J. G. WEAVER, S. L. EMSWELLER, and D. V. LUMSDEN (*North Carolina Sta. Rpt. 1938, pp. 45–49, 51, 52, 53, 54*).—Among studies the progress of which is reviewed are fertilizer requirements for peaches growing in the Piedmont, relation of tree vigor and fruit thinning to quality of the peach, effect of B on the peach, effect of cover crops and clean cultivation on the peach, apple spraying and varieties, raspberry and dewberry breeding, pruning of the Lucretia dewberry, fertilizer for the raspberry, spacing, fertilizing, and culture of the strawberry, tomato and lettuce breeding, rose varieties, fertilizer for narcissus and other bulbous plants, and carnation varieties.

Honey as a stimulant to the rooting of cuttings, R. W. OLIVER (*Sci. Agr., 19 (1939), No. 9, pp. 586–588, fig. 1*).—The treatment, prior to placement in propagating frames, of cuttings of *Thuja occidentalis pyramidalis* for 24 hr. with a 25-percent solution of honey gave such promising results in rooting that the experiment was repeated with chrysanthemums. Again honey solutions gave good results equal to, if not better than, those secured with a commercial growth-promoting substance.

The effect of fertilizer placement, as influenced by soil moisture, on seed germination, M. M. PARKER, and R. C. OLIVER. (Va. Truck Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 533–536, figs. 3*).—Under greenhouse conditions where different degrees of soil moisture could be maintained it was found, in plantings of snap bean, pea, and cabbage seeds, that the amount of injury which occurs when fertilizers are mixed with the soil or placed in a band beneath the seed depends primarily upon the concentration of the fertilizer salts, which in turn is dependent in part on soil moisture. Under relatively low moisture conditions, fertilizers mixed with the soil were initially more injurious to germinating seed than those placed in a band 2 in. beneath. Fertilizers placed 2 in. away from and 2 in. below the level of the seed were relatively noninjurious irrespective of soil moisture content. Next to the unfertilized check, side placement resulted in the lowest concentration of salt near the seed.

Low temperature injury to certain vegetables after harvest, L. L. MORRIS and H. PLATENIUS. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 609–613, figs. 3*).—Low temperature injury of cucumbers, commonly called pitting, was found to occur at various temperatures from 33° to 60° F., but was progressively less as the temperature increased. Relative humidity was an important factor at all temperatures tested, the severity of injury decreasing as the relative humidity increased. Comparable results were secured with California Wonder peppers subject to various temperatures and conditions of relative humidity. Histological studies indicated that water relations in the tissue near the epidermis are concerned with pitting. It appeared, however, that desiccation is not the primary cause but simply the result of injury to certain cells on the epidermis, and the authors suggest that the direct cause may be low temperature, mechanical injury, or suboxidation.

Variation in asparagus in relation to size and shape of plots, H. B. Cordner. (Okla. A. and M. Col.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 565, 566*).—Records taken in 1937 and 1938 on plats of Mary Washington asparagus set in the spring of 1935 showed a decline in variability in yield in the second harvest season as compared with the first. The decrease in variability became proportionately less as plat size was increased by successive additions of 14-plant units. Plats larger than the equivalent of from 4 to 5 units did not appear practical. There was no special advantage in using plats 70 ft. long, as compared with 35-ft. plats of the same total area.

Influence of summer legumes on the early spring crop of snap beans in south Alabama, L. M. Ware. (Ala. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 509–512*).—Stating that commercial crops of vegetables are produced too early in the year in southern Alabama to take advantage of winter legumes, the author studied the effects of summer crops of crotalaria and various other plants with and without N fertilization of the spring-grown truck crop, snap beans. Without supplemental N, three legume crops were turned under before a significant increase in the yield of beans was secured. The yield of legume plats receiving no commercial N did not, in 7 yr., attain the maximum secured with the addition of one-half the standard rate of N with legumes nor that of the plats receiving the full application of N without legumes. After the fourth year, yields were higher on plats receiving one-half the standard rate of commercial N and legumes than on the nonlegume plats receiving the standard rate of N. Laboratory tests in the fall of 1937 showed somewhat higher total N in the soil receiving legumes, but the increases in organic matter as determined by the ignition method were negligible. The author suggests that N applications may have influenced the amount and character of biological activity in the soil, which in turn may have influenced the character of the organic material, availability of minerals, and similar factors.

The relation of the pericarp to tenderness in sweet corn, D. M. and R. M. Bailey. (Maine Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 555–559, fig. 1*).—In studies with five varieties of sweet corn—an open-pollinated variety, two inbred lines, and two hybrids—there was noted striking similarity in pericarp development as revealed by morphological examination during the precanning, canning, and postcanning stages. As shown by the pressure test, resistance to puncture increased markedly with advancing maturity. Varietal differences were recorded in tenderness and pericarp thickness; and, in general, those varieties with the lowest puncture index at any given stage of maturity had the thinnest pericarp.

The influence of climatological factors on anthesis and anther dehiscence in the cultivated cucurbits.—A preliminary report, H. L. Seaton and J. C. Kremer. (Mich. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 627–631*).—Observations on cucumbers, gherkins, muskmelons, watermelons, squashes, and related plants indicated that the several species of cultivated cucurbits under study may be divided roughly into three groups on the basis of optimum temperatures for anthesis and dehiscence. The groups include (1) pumpkins and squashes, with an optimum temperature at from 50° to 55° F.; (2) watermelons, gherkins, and cucumbers, with an optimum between 65° and 70°; and (3) cantaloups and melons, varying somewhat but with optima for cantaloups at from 68° to 70° and for honeydews and casabas at from 70° to 75°. Climatological factors other than temperature, such as relative humidity and wind movement, apparently were not operative in any of the three groups of cucurbits except as they influenced temperature. The activity of bees in the

flowers early in the morning was taken as a good indication of the stage of dehiscence.

Some examples of heterosis in the cucumber Cucumis sativus L., A. E. HUTCHINS. (Minn. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 660–664*).—Observations on nine progenies grown from seed obtained by crossing the Mincu, an early-maturing pickling variety, with slicing cucumbers such as Davis Perfect and Arlington White Spine, showed in eight of the nine combinations higher yields per plant than those of the higher-yielding parent. The one exception, Mincu × Davis Perfect, yielded more fruits than the lower-yielding parent, Mincu. The average weight per fruit in the F_1 generation was in all cases significantly greater than that of the smaller-fruited parent. Most of the yield differences in favor of the F_1 generation were accumulated during the first half of the picking season, suggesting that hybrid vigor may be an effective means of increasing early yields.

Lengthening the storage period of cucumbers, J. WHITACRE, L. R. HAWTHORN, and S. H. YARNELL (*Texas Sta. Bul. 576 (1939), pp. 23, figs. 5*).—This second and more complete report (E. S. R., 74, p. 637) covers 5 seasons of study with cucumbers grown at Winter Haven and at College Station. Of 18 storage treatments tested, the following, (1) wrapping individually in moisture-proof Cellophane, (2) containers lined with moisture-proof Cellophane, and (3) unwrapped in a refrigerator humidifier, all at 40° F., proved most effective from the standpoint of weight, color, firmness, texture, and palatability. With any of these 3 methods, cucumbers were kept for from 8 to 10 days in as good condition as when fresh and up to 2 weeks in acceptable condition. The use of moisture-proof Cellophane in individual wrappers or for lining shipping containers appears desirable from a commercial standpoint, and the refrigerator humidifier for use in the home.

Behavior of certain characters in breeding Yellow Bermuda onions, L. R. HAWTHORN. (Tex. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 668–673*).—A 6-yr. program of selection and inbreeding of Yellow Bermuda onions at the Texas Winter Garden Substation indicated that by proper selection much of the off-type material could be eliminated. As a direct result there was obtained one line of Yellow Bermuda which apparently was highly uniform and superior to commercial strains in relative freedom from doubling, premature seeding, and off colors. Inbreeding tended, however, to reduce the size of bulbs.

Inheritance of the immature fruit color of peppers, M. L. ODLAND and A. M. PORTER. (Conn. State Col.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 647–651*).—Stating that many peppers are marketed while still immature and that the color of the fruits at this stage is therefore an important consideration, the authors report that the lettuce- or yellowish-green color of Hungarian Yellow Wax and Tobasco was found to be dominant to the sulfury-white of Ornamental and recessive to the cedar-green of Oshkosh and Red Cherry. In both cases a single pair of factors apparently was concerned. A number of genotypes is suggested for the several colors.

Growth and distribution of roots of the Perfection pimiento in Georgia, H. L. COCHRAN. (Ga. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 59 (1939), No. 3, pp. 185–197, figs. 14*).—As soon as the pimiento seed germinates in the hotbed, which usually takes about 10 days, the young primary root grows typically directly downward. Some 2 mo. later, at the time the plants are ready to set in the field, the primary roots extend down to the 10- to 12-in. level and are well supplied with laterals measuring from 4 to 10 in. in length and

about 0.6 mm. in diameter. The primary or taproot is usually more or less damaged in the process of transplanting. However, after 60 days in the field, the roots completely occupy the first foot of soil on all sides of the plants to a depth of 14 in. Mature 8-month-old plants have a root spread of from 48 to 52 in., with many of the once horizontal laterals being found in the second foot of soil. Relatively few roots penetrate the stiff clay subsoil any deeper than 24 in.

Response of tomato (Lycopersicum esculentum, Mill. var. Marglobe) to certain vernalization treatments, H. L. Stier. (Md. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 708–714*).—After imbibing water for 1, 2, or 3 days at 78° F., during which germination processes began, tomato seeds were exposed to low temperatures (32° and 35°) for 15, 30, and 45 days. Upon removal from cool storage, each of the lots was subdivided into two parts, one of which was subjected to continuous light for 30 days and the other to the normal daylight. Under greenhouse conditions, certain of the vernalization treatments caused a definite acceleration in development, with blooming from 10 to 14 days earlier. Continuous light exposure of the seedlings had a hastening influence on blooming in the case of the 15- and 30-day lots. Summing up, the author concludes that the response of the tomato to vernalization was very slight under field conditions and of no practical significance in the greenhouse.

Copper content of some New Jersey grown tomatoes, A. L. Weber and H. C. McLean. (N. J. Expt. Stas.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 705–707*).—Analyses of a limited number of samples of New Jersey grown tomatoes harvested in the green, yellow ripe, and red ripe stages showed them to contain from 9.8 to 22.3 p. p. m. of Cu on a dry weight basis. In general, the coarser the physical condition of the soil the higher was the Cu content, and to a certain degree the lower the pH of the soil the higher was the Cu content of the tomatoes. There was a progressive increase in Cu with the maturation of the fruits. Certain data are presented on the Cu content of processed tomatoes.

Pruning of fruit trees should be planned to meet requirements of stages of growth, L. R. Bryant (*Colo. Farm Bul. [Colorado Sta.], 1 (1939), No. 2, pp. 11, 12*).—This is a brief discussion of principles and practices.

A method by which trees may be grown with their roots in two soils, N. L. Partridge. (Mich. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 77–80, fig. 1*).—A description is given of equipment in which dwarf apple trees were grown with approximately half of the roots in separate galvanized iron boxes. The soil, moisture, and nutrient supply available to the two portions of the root system were varied. The experimental results show that the trees, grown with an abundant supply of N, stored enough N so that no deficiency became apparent during one growing season even when further supplies were not given during the summer. During the second growing season, N deficiencies were apparent in those trees or portions of trees which received no additional nitrogen.

The influence of cultural and environmental conditions on the content of organic matter in orchard soils, R. D. Anthony. (Pa. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 13–17*).—Suggesting that the physical condition of the surface and the structure of the upper inch or two of the soil is often the controlling factor in the absorption of rainfall, the author reports that on a 5° to 7° slope a rainfall of 0.77 in. falling in 15 min. caused a loss of nearly 600 lb. of soil per acre from an area under annual cultivation but recently seeded with a cover crop. In the same rain an adjacent sod plat

lost no water or soil. Soil long continued in sod is said to approach a maximum content of organic matter for the type and for the climate. That fertiliser and cropping treatments are slow to influence organic matter content was shown in a soil-cylinder experiment. In the beginning the soil averaged 3.14 percent organic matter, and after 5 yr. of differential treatments the various cylinders showed a surprising uniformity. All lost organic matter, even those supplied annually with a definite amount of chopped green matter. The cylinders with no organic matter added averaged 2.2 percent, and those with supplemental material, 2.33 percent. Apparently the soils had attained equilibrium with factors of climate and culture. The need of exercising care in drawing general deductions from widely separated observations of a comparable character was indicated.

Some results from orchard irrigation in eastern Nebraska, C. C. WIGGANS. (Nebr. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 74–76*).—Supplemental irrigation of apple trees growing on a deep, porous loess soil in eastern Nebraska was found beneficial in increasing the proportion of fruit of desirable market size. Records taken on seven varieties showed an average of 9.2 percent of apples below 2.5 in. in diameter in the irrigated plats as compared with 44.3 percent in the nonirrigated. Soil samples collected throughout the year in a block of Delicious spaced 30 by 33 ft. showed that the 22.68 in. of rain occurring between November 9, 1937, and October 26, 1938, was insufficient for both the trees and the cover crops, and that 15.2 in. of supplemental irrigation was apparently required to meet all requirements.

Studies of top and root growth of young apple trees in soil and peat-soil mixtures of varying moisture contents, H. B. TUKEY and K. D. BRASE. (N. Y. State Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 18–27, figs. 4*).—Carefully selected 2-year-old McIntosh trees on Malling I roots were grown in glass-sided boxes filled in some cases with soil and in others with a mixture of soil and German peat moss. In addition, the effects of abundant, medium, and dry moisture conditions were compared. The initiation of new roots and the rapidity of spread were greatest in the peat-soil mixtures. In one case, where trees were planted in a pocket of moss, the roots grew rapidly in the moss but did not extend far into the adjacent soil. There were no significant differences in the time of initiation of top buds, but subsequently the shoots of the peat moss lots grew more rapidly. The maximum shoot growth and the greatest trunk girth increment was made by the trees in the wet mixed peat moss and soil. Studies of the soil atmospheres showed a consistently higher $CO_2:O_2$ ratio in the wet soil where root development was poorest. Where moss was incorporated with the soil, aeration was notably improved.

A preliminary report on a study of the nutrient level of orchard soils in the eastern Panhandle of West Virginia and its relation to tree condition and productivity, D. S. BROWN. (W. Va. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 45–48*).—Samples of the top 8 in. of soil collected from representative apple orchards were examined as to pH, percentage of organic matter, exchangeable K, and available P. The 12 different soil series sampled were divided roughly into limestone and shale groups. The total pH range for the limestone soils, 5.19 to 7, was only slightly higher than that of the shales, which was 4.66 to 6.69, but the average was somewhat higher in the limestones. The total range in values for exchangeable K was much greater for the limestone than for the shale soils. Available P tended also to be higher in the limestone soils. Organic matter was slightly more abundant in the limestone types.

As to the trees, their condition was superior and their yields higher on the limestone soils, and cover crops grew better despite the greater shade offered by the larger trees.

Some results and suggestions regarding the use of calcium cyanamid on apples, R. H. SUDDS and R. S. MARSH. (W. Va. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 36–40*).—Growing on a well-drained Frankstown silt loam with a mean pH of 5.4 in the upper 6 in. of soil at the beginning of the experiment in 1936, 25-year-old York Imperial trees were supplied in the early spring of 1936, 1937, and 1938, with 7 lb. of nitrate of soda or its equivalent of Cyanamid. In early October of 1937, following a hot, dry period in the summer, it was noted that the trees receiving Cyanamid showed foliage injury. Partial defoliation followed. Blossom counts the succeeding spring failed to show any consistently significant differences between the nitrate and Cyanamid trees in fruit setting. Analyses of cumulative trunk increments for the two groups of trees showed the nitrated trees to have made more growth. Yields were also significantly larger in the nitrated trees. Dry weather occurring in the spring of 1937 and the concentration of the fertilizer to the area beneath the branches, rather than broadcast over the entire area, are factors believed to contribute to injury.

Carbon dioxide assimilation of apple leaves on "thin" and "thick" wood, E. P. CHRISTOPHER. (R. I. Expt. Sta.) (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 247–249*).—Leaves growing on a vigorous 25-year-old McIntosh tree were found to differ but slightly in their assimilating rate whether growing on thick or thin branches. Apparently the thickness of the wood had little direct influence on the assimilation rate and cannot account for the spindly growth. When a leaf growing on a thin shoot was so placed as to receive more light than the corresponding leaf on thick branches, it showed a marked gain in assimilation. Thus light, in this case at least, appeared to be a determining factor in regulating CO_2 assimilation.

The affinity of varieties other than Grimes on Virginia Crab stocks, J. A. MCCLINTOCK. (Purdue Univ.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 131–132*).—Observations on the growth of Blackjon, Blaxtaman, Gallia, Golden Delicious, Grimes Golden, McIntosh, Richared, Starking, and Turley, all scaffold-worked on Virginia Crab, showed material differences among the varieties. Five, namely, Golden Delicious, Turley, McIntosh, Gallia, and Starking, made more growth than did Grimes Golden, which earlier studies (E. S. R., 80, p. 196) have shown to thrive on Virginia Crab. Blaxtaman was the only variety to show a definite lack of affinity.

Further notes on the Malling clonal stocks in relation to McIntosh and Wealthy, L. SOUTHWICK and J. K. SHAW. (Mass. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 133–137*).—Further studies (E. S. R., 76, p. 792) on the behavior of the two varieties on eight rootstocks ranging from very dwarfing to very invigorating in their influence on the scions showed Malling XII to be outstanding in promoting vegetative growth, followed closely by Malling XVI. Yields of both McIntosh and Wealthy were greatest on Malling XVI. Malling XV was notable in its limiting effects on production. Of semidwarfing types, Malling IV and Malling I appeared superior. The very dwarfing types proved unsatisfactory. Variability determinations suggested little or no benefit from the use of clonal stocks with respect to increasing uniformity.

The effect of copper compounds applied to spur units during bloom upon the set of apple fruits, L. H. MACDANIELS and E. M. HILDEBRAND. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 230–233*).—Experiments in which paired blooms located in single clusters on 25-year-old Northern Spy trees

were pollinated with Delicious and treated in different sequences with bordeaux mixture or Cu-lime dust failed to show the expected detrimental effects of the Cu materials on fruit set. The application of spray or dust 24 hr. prior to pollination was evidently a deleterious practice. In a series where both blooms were pollinated alike and only one sprayed or dusted, the spurs set as well as or better than the corresponding checks where both blooms were simply pollinated. It is suggested that Cu compounds may be applied to blooming apple trees without seriously reducing the set of fruit.

Annual bearing in the Wealthy apple was induced by blossom thinning, A. C. BOBB and M. A. BLAKE. (N. J. Expt. Stas.). *(Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 321–327, fig. 1).*—The possibility of inducing annual bearing in Wealthy trees which have reached a well-defined biennial status was shown in investigations beginning in 1935 when 19-year-old Wealthy trees were thinned in various manners. On one tree, all class I and II spur clusters were thinned in the pink bud stage to from 10 to 12 in. apart. At the same time all class III and IV clusters and all axillary and terminal clusters were removed. The immediate result was to stimulate leaf development on all spurs and to encourage blossom bud formation for the succeeding year. There was some evidence that the blossom thinning employed was even more severe than necessary for the promotion of annual bearing.

A biennial bearing record of an unproductive Baldwin block, G. H. DICKSON *(Sci. Agr., 19 (1939), No. 9, pp. 583–585).*—Records taken on a block of Baldwin apple trees planted at Vineland, Ontario, in 1921 show a well-pronounced biennial tendency despite the fact that the trees have never borne a heavy crop. Cultural treatments appear to have no influence on the development of biennial fruiting.

Origin of mechanical injuries to apples, C. W. ELLENWOOD and J. H. GOURLEY *(Ohio Sta. Bimo. Bul. 199 (1939), pp. 73–80).*—Observations on three varieties in 1936, two in 1937, and one in 1938 showed that the most serious source of injury was in the grader. The manner of emptying the picking container into the orchard crate was also important. Bruising occurring on the tree during growth was of minor significance. The human factor was important, with considerable variation recorded among pickers. The type of picking container did not appear of material significance. It is suggested that sponge rubber or other padding should be used wherever possible in the bins and tables of the grading machines.

Effect of certain waxing treatments at time of harvest upon the subsequent storage quality of Grimes Golden and Golden Delicious apples, C. W. HITZ and I. C. HAUT. (Md. Expt. Sta.). *(Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 440–448, figs. 2).*—Working with Grimes Golden in 1936 and 1937 and with Grimes Golden and Golden Delicious in 1938, the authors found that waxing is an effective treatment in reducing the percentage of wilt and of weight loss. Holding the fruit for 1 week at moderate temperature after picking and before waxing was desirable for the promotion of satisfactory flavor and color. In Grimes Golden the 1 week at moderate temperature greatly reduced subsequent scald, as compared with immediate waxing and storage. Preripening for more than 1 week greatly increased wastage of Grimes Golden in storage. In both varieties waxing retarded the development of yellow color. In the case of Grimes, preripening for a week at from 57° to 60° F. before waxing and cold storage prevented the development of undesirable off-flavors which are said often to accompany waxing.

Root distribution and root and top growth of young peach trees, F. F. COWART. (Ga. Expt. Sta.). *(Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 145–*

149).—Five of a lot of Mikado (June Elberta) peach trees planted in March 1937, after careful selection for uniformity of root and top growth, were dug in October 1937. Four were dug in October 1938. The soil was a sandy loam of the Cecil series. The roots of the 1-yr. trees penetrated to an average depth of from 30 to 36 in. and had a total spread of 6 ft. The roots of the 2-yr. trees reached a depth of 4.5 ft., with a total spread of 12 ft. Totals of 82.9 and 67.2 percent of the roots of the 1- and 2-year-old trees, respectively, were found in the upper foot of soil. Top : root ratios based on total dry weights were much narrower in the 1-year-old than in the 2-year-old trees.

Phosphate phosphorus and soluble nitrogen changes in living and winter killed peach twigs, C. S. WALTMAN. (Ky. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 181–184, fig. 1*).—Low temperatures of −18° and −22° F. on January 22 and 27, 1936, caused splitting and loosening of the bark on the trunks of a group of 11-year-old Elberta trees, the twigs of which were being sampled at weekly intervals to follow the seasonal changes in soluble N and phosphate P. The most significant observation was the very great increase in the phosphate P in all the trees which were injured sufficiently to cause subsequent death. Apparently the passage of P through the tissues was not appreciably hindered by the injury to the sapwood. In the absence of new growth there was no utilization of P, hence the accumulation.

Response of peach trees to potassium and phosphorus fertilizers in the Sandhill area of the Southeast, L. E. SCOTT. (S. C. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 56–60*).—Elberta trees set in 1929 on a newly cleared area of coarse Norfolk sand were supplied annually with fertilizers containing N only, N+P, N+K, and N+P+K. Yields recorded over a 6-yr. period, 1933–38, were largest on the complete-fertilizer plats. The N+K plats yielded nearly as well. The −K plats produced low yields throughout the period and the quality of the fruit produced was inferior, many of the peaches failing to develop normally. Beginning in 1934 there was a definite indication of foliar injury in the −K trees. Later the symptoms became acute, with leaves attaining only about one-third of their expected size. The leaves of the −P trees were darker green than normal and of a rather leathery texture. The lack of K had no well-defined influence on trunk development, whereas a lack of P did significantly decrease trunk growth as compared with the complete-fertilizer trees. All of the incomplete-fertilizer treatments resulted in fewer buds per given length of shoot growth. Cover crop growth was especially poor in the −P plats.

Effect of fruit thinning on size, color, and yield of peaches and on growth and blossoming of the tree, H. B. TUKEY and O. EINSET. (N. Y. State Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 314–319, figs. 3*).—Using the stage of development of the fruit, rather than the calendar date, as a key to the time of thinning, the authors found in the case of Elberta trees which were 6 yr. old at the beginning of the study that thinning at full bloom or early in stage I resulted in the largest size and best color of any treatment. Thinning during the first 2 yr., regardless of the time, tended to reduce the total yields, but when the light crop year which followed was included the early-thinned trees surpassed the others in total yield. Because of the larger third-season crop and the better appearance of the fruit in the other 2 yr., early thinning materially increased the market value of the fruit. Thinning early in stage I is conceded more practicable than during the blossom period.

Effect of storage temperatures on peaches, M. H. HALLER and P. L. HARDING (*U. S. Dept. Agr., Tech. Bul. 680 (1939), pp. 32, figs. 13*).—Investigations extending over four seasons, 1930–33, and concerned principally with Carman, Belle,

Elberta, and J. H. Hale peaches grown in Virginia and Maryland indicated the importance of prompt cooling of the fruit after harvest if it is to be held for any considerable time. At the best, peaches could not be held for more than from 2 to 4 weeks, depending on variety and growing conditions, without serious loss of quality or the development of break-down. At a temperature of 32° F., recommended by the authors for storing peaches, there was practically no softening, and upon removal from storage the fruit ripened at room temperature with reasonably good quality. The rate of softening during storage increased with the temperature and was very rapid at from 70° to 80°. Storage temperature did not affect the percentage of dry weight or of sugars except as it influenced the relative rates of water loss by transpiration and of carbon loss by respiration. The amount of soluble pectin in the juice increased markedly with the ripening and softening of the fruit. Internal break-down or low-temperature injury developed earlier at 36° or 40° than at lower or higher temperatures. At 50° there was some break-down, but none at from 60° to 80°. There was a marked loss in flavor of peaches ripened at 50° as compared with higher temperatures. The influence of temperature on the rate of respiration was greater with the peach than with many other fruits.

Histological study of the developing fruit of the sour cherry, H. B. Tukey and J. O. Young. (N. Y. State Expt. Sta.). (*Bot. Gaz., 100 (1939), No. 4, pp. 723–749, figs. 8*).—This paper illustrates and discusses the gross development of the fruit of the sour cherry, variety Montmorency, from 18 days before full bloom to fruit ripening, and the histological changes occurring during four stages of development, namely, the prebloom stage, the 20 days of rapid development following full bloom, a period of 16 days of retarded development, and a period of 21 days of rapid development preceding maturity.

Transpiration in strawberries, G. F. Gray. (Okla. A. and M. Col.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 492–494*).—Young runner plants of Blakemore possessing considerable drought resistance and of Dorsett lacking in this respect were grown in potometers in the greenhouse. The results showed that early in the season (August) Dorsett transpires more rapidly than does Blakemore. The difference was not apparent as the plants became more mature, even under comparable conditions as to the evaporating power of the air. In trials in November, with soil-grown plants and with the relative humidity somewhat higher, the position of the two varieties was reversed, with Blakemore exhibiting the higher transpiration rate.

The distribution of black raspberry roots under mulch and cultivation treatments, L. Havis (*Ohio Sta. Bimo. Bul. 199 (1939), pp. 81–88, figs. 3*).—This is a more extensive presentation of material previously noted (E. S. R., 81, p. 792).

The frost control problem, with special reference to blueberries, S. Johnston (*Michigan Sta. Quart. Bul., 22 (1939), No. 1, pp. 3–10*).—On the basis of South Haven conditions it is believed that efforts to prevent frost damage by the use of oil heaters would prove unprofitable. In the 14 yr. during which cultivated blueberries have been under observation, there was only one killing frost and that occurred in 1938. Various cultural practices that would lessen the damage by frost are discussed. Among these are the maintenance of a clean soil surface during the blooming period, provision for drainage to keep the soil from becoming too wet in early spring, and the use of varieties possessing resistance to low temperature.

The resistance of certain highbush blueberry varieties to injury by frost, S. Johnston (*Michigan Sta. Quart. Bul., 22 (1939), No. 1, pp. 10, 11*).—Observations following severe frosts occurring on May 12 and 13, 1938, during full bloom, showed marked variation in the resistance of varieties to frost. Ran-

cocas, Rubel, Adams, and Jersey showed definite resistance, while Harding, Cabot, and Pioneer were susceptible. The records were taken on mature plants from 4 to 6 ft. tall because there was an almost complete loss of blooms on smaller plants of the same varieties, due, apparently, to location near the soil. Moderately injured blossoms failed to set any fruit in Jersey and Cabot, and only a small percentage set in Pioneer and Rubel.

Grape varieties in Arkansas, J. E. Vaile (*Arkansas Sta. Bul. 379 (1939), pp. 24, fig. 1*).—Of 162 varieties of American-type grapes tested by the station, 72 were rated as moderately to highly productive at one or more of the test locations. Of these, only 40 proved suitable for planting in Arkansas, the rest being eliminated by various shortcomings, such as poor dessert quality, susceptibility to black rot, uneven ripening, poor shipping quality, or lack of vigor. A total of 17 varieties proved worthy of planting throughout the State. The others were restricted to definite regions. None of the 19 vinifera-type varieties tested proved satisfactory anywhere in the State because of a lack of low-temperature resistance and susceptibility to black rot. The data are largely presented in tabular form.

Response of American grapes to various treatments and vineyard practices, J. R. Cooper and J. E. Vaile (*Arkansas Sta. Bul. 378 (1939), pp. 74, figs. 10*).—Investigations conducted over a period of years upon various phases of grape growing are discussed. The pruning back of young vines to two buds at the beginning of the second year was found to retard the onset of profitable bearing. The Kniffin system of training was most desirable for Concord and most other varieties of American grapes. The most satisfactory spacing for the Concord was 7 ft. apart in rows 10 ft. apart. In Concord, fruit production increased from the first to the fourth node and remained fairly constant to the tenth with an increase in the eleventh and twelfth nodes. Fruit bud initiation began in June. On Campbell Early the cluster weights per node increased up to the sixth node, remained constant to the tenth, and decreased thereafter. As to total number of buds per Concord vine, 60 is concluded to be the maximum per plant if sustained production is maintained. Thinning of the cluster of American grapes decreased yields.

On light soils, N fertilizers increased the growth and yield of Concord and Campbell Early vines, with even greater increments from the use of complete materials. On Clarksville silt loam, neither fertilizers nor manures gave profitable increments in the yield of Concord. Fertilizer did not influence the quality of the fruit. The use of vigorous rootstocks, such as Cynthiana, tended to increase the production of Campbell Early, Concord, and Moore Early.

The Concord ripened much more uniformly at Fayetteville than at the Hope Substation. Uniformity of ripening was not influenced by culture or fertilizer, but heavy dormant pruning had a beneficial effect. Thinning Concord grapes to one cluster per shoot increased the evenness of ripening materially.

Nursery tests with grape rootstocks, E. Mortensen. (Tex. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 153–157*).—Observations at Winter Haven, Tex., on the resistance of 13 species of Texas grapes to phylloxera, *Phymatotrichum* root rot, and nematodes indicated that *Vitis candicans, V. cinerea, V. champini,* and *V. monticola* are the most promising species. Grafting experiments in which horticultural varieties of *V. vinifera* were worked on resistant roots indicated definite possibilities in this direction, but considerable testing would be required to determine the most suitable combinations.

An analysis of growth and yield relationships of coffeetrees in the Kona district, Hawaii, J. H. Beaumont. (Hawaii Expt. Sta.). (*Jour. Agr. Res. [U. S.], 59 (1939), No. 3, pp. 223–235, fig. 1*).—Analyses of measurements taken

in two coffee plantations, one 12 yr. of age and used as a fertilizer experiment and the other 7 yr. of age and relatively low in vigor, showed striking differences in growth and yield characteristics. In 1937, a year of high yields, the younger trees produced less than half as much as did the well-fertilized, older trees. However, with minor exceptions, the same relationships between growth and yield were evident between each group of trees. The author concludes that certain growth responses of the tree are largely dependent upon or conditioned by the size or volume of the developing crop; that the volume of the crop is largely determined by the growth made in the preceding growing and crop season; that a dominant weather factor, such as spring rains, may temporarily disturb these relationships; and that by judicious pruning and fertilization—the first of which would tend to reduce the current or immediate year's crop and both of which would tend to increase the production of vigorous-fruiting wood—and perhaps by other cultural practices such as mulching which would tend to conserve moisture, the extreme fluctuations in annual yields may be reduced and the average yield, as well as the general size and vigor of the tree, may be considerably increased.

Relationships between rainfall and coffee yields in the Kona district, Hawaii, L. A. DEAN. (Hawaii Expt. Sta.). (*Jour. Agr. Res. [U. S.], 59 (1939), No. 3, pp. 217–222, figs. 4*).—Statistical analyses of data on rainfall and coffee production for the years 1901-36 in the Kona district of Hawaii show for each year two distinct periods of heavy rainfall and one period of markedly light precipitation. The dry season occurs during the winter months, and the months that have low mean rainfall have the most irregular rainfall. Much of the variability in annual coffee production may be ascribed to fluctuations in the February-June rainfall occurring during the years in which the fruiting wood was produced.

Soils and fertilizers in relation to the yield, growth, and composition of the coffee tree, L. A. DEAN and J. H. BEAUMONT. (Hawaii Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 28–35, figs. 2*).—In two separate investigations there was recorded a significant response to K applied in conjunction with N. On the other hand, phosphatic materials showed no material benefit. The trees receiving K contained higher percentages of K in all parts, and the new growth contained higher percentages of starch.

Effect of certain growth substances on inflorescences of dates, R. W. NIXON and F. E. GARDNER. (U. S. D. A.). (*Bot. Gaz., 100 (1939), No. 4, pp. 868–871, fig. 1*).—Stating that seedless fruits often develop when pollination is prevented by bagging and that the parthenocarpic fruits are usually smaller than pollinated dates and lack their quality, the authors report the results of treating date flowers with indoleacetic, indolebutyric, and naphthaleneacetic acids, alone and in combination with pollen, both before and after application of the pollen. Higher concentrations of indoleacetic and indolebutyric acids resulted in the shedding of practically all the blooms. With lesser concentrations there was less shedding, but the fruits were no different from those produced without growth-producing substances. Naphthaleneacetic acid in dust form was ineffective. In lanolin paste and in higher concentrations of aqueous solution, this acid inhibited the development of the carpels, which eventually became dry and spongy. At the same time, the enveloping perianths persisted and in some cases showed an apparent enlargement, thus indicating an effect of the acid in delaying the usual abscission.

Data and notes on Cineraria, N. ALTER (*Ohio Sta. Bimo. Bul. 199 (1939), pp. 95–99, fig. 1*).—A total of 26 varieties and strains of *Cineraria* were compared as to time of bloom, height, size of flowers, color, and general appearance.

Effect of the photoperiod on the chrysanthemum [trans. title], S. Wóycicki (*Gartenbauwissenschaft, 13 (1939), No. 2, pp. 194–203, figs. 6*).—Very definite hastening of blooming of the chrysanthemum was secured by shortening the photoperiod. The best results were attained by darkening in the morning hours from daybreak to 7 a. m. Darkening in midday from 10 a. m. to 2 p. m. had no effect. The best season for photoperiodic effect was in the latter part of the summer.

Arkansas rose experiences in 1938, H. R. Rosen. (Ark. Expt. Sta.). (*Amer. Rose Ann., 1939, pp. 96–99*).—Inoculation experiments showed that the blackspot fungus can overwinter in dead leaf material. In a study of the influence of mulches and fertilizers on two varieties there was noted no benefit from any treatment, either in growth or blossoming. Cuprocide (red Cu oxide) dusts were found as effective as S materials in the control of blackspot in 1938 and apparently caused less injury to the foliage. Certain promising blackspot-resistant seedlings were secured by breeding.

Rose research at Cornell, R. C. Allen. (Cornell Univ.). (*Amer. Rose Ann., 1939, pp. 85–87*).—Among interesting observations was that the incorporation of peat moss in the soil resulted in increased vigor, longer stems, and more flowers per plant. In the first season there was no difference, whether the plants were set with the graft union at the soil level or somewhat below or above. Soaking the plants in a growth-promoting solution prior to planting had no significant results. The application of a mixed fertilizer of 5–10–5 grade, 3 lb. per 100 sq. ft., at the time the new shoots were about 3 in. long, was adequate. A summer mulch of peat moss was beneficial, lowering the soil temperature and increasing the soil moisture.

Rose understock breeding for 1938, T. J. Maney. (Iowa Expt. Sta.). (*Amer. Rose Ann., 1939, pp. 92–95*).—A brief account is given of the results of experiments in producing hardy thornless rose stocks. Crosses of *Rosa multiflora cathayensis* and Chenault No. 5892, a variation of *R. multiflora*, with a thornless type of *R. multiflora* gave a number of thornless seedlings. *R. dumetorum*, because of its hardiness, disease resistance, and nonsuckering habit, showed promise as a parent. In 1938 many seeds were obtained from crosses of *R. setigera* with pollen from Ophelia, Golden Ophelia, Gruss an Aachen, Rocket, and Smiles. Abundant seed was secured from crosses of *R. canina* with thornless types of *R. multiflora* and *R. blanda*. Good success was secured in crossing *R. rubiginosa* with *R. multiflora* and Harison Yellow. As a result of the breeding studies there were some 10 thornless seedling stocks ready for distribution in 1939.

A rose-production experiment at Pennsylvania State College, E. I. Wilde. (Pa. Expt. Sta.). (*Amer. Rose Ann., 1939, pp. 88–91*).—Of several soil mixtures used for growing Grenoble hybrid tea roses planted in the fall of 1937, that containing one-half loam, one-fourth stable manure, and one-fourth hyperhumus gave the best results as measured by the number of blooms in 1938. In all treatments the deeply prepared beds, 24 in., gave the best results, explained in part by a very dry period of 8 weeks in the early summer. At the end of the 1938 season there were no significant results from any of the several fertilizer treatments employed.

The effect of synthetic growth substances on the rooting and subsequent growth of ornamental plants, L. C. Chadwick and D. C. Kiplinger (*Ohio Sta. Bimo. Bul. 199 (1939), pp. 89–95*).—In general, hardwood cuttings did not respond to treatment with indolebutyric and naphthaleneacetic acids. Treatment of softwood cuttings of greenhouse plants and woody ornamentals and mature cuttings of narrowleaf evergreens decreased the time required for rooting. In

general, plants difficult to root by cuttings were not materially benefited by treatment. In most cases, the treatments caused more roots to be produced over a larger stem area. Apparently there was no consistent relation between the number of roots induced and their length. The external position of roots on plants which exhibit specific rooting habits was not influenced by the treatment, nor did treatments of roots give consistent responses, although causing a general decrease in root and shoot production.

FORESTRY

Forest production areas: Tennessee and United States, C. E. ALLRED and F. M. FITZGERALD (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 93 (1939), pp. I+57, figs. 34*).—Continuing this series (E. S. R., 81, p. 653) there are presented data concerning the commercial and noncommercial forest lands in Tennessee, species and their relative abundance, forest industries, forest products, etc., in relation to those of the United States as a whole.

Woodlands of Kansas, E. R. WARE and L. F. SMITH. (Coop. U. S. D. A.). (*Kansas Sta. Bul. 285 (1939), pp. 42, pls. 4, figs. 4*).—This bulletin presents the results of a forest survey made in 1937. The natural forests of Kansas are, with the exception of small areas of red cedar, composed entirely of hardwood trees. Three distinct types were recognized—mixed hardwoods, cottonwoods, and blackjack post oak. Old growth saw timber extends over 386,500 acres, or 36 percent of the 1,073,000 acres of naturally forested land. Cordwood stands occupy 497,800 acres, equal to the total of old growth and second growth. The four principal species of saw timber are elm, cottonwood, oak, and black walnut. There are some 86,000 plantations, covering 165,000 acres. The average size is small, 46 percent being less than 1 acre in extent. Of the planted forests, 74.9, 14.9, 10.1, and 0.1 percent are classified, respectively, as field plantings, farmstead windbreaks, farm wood lots, and school-ground plantings. Trees found suitable for State-wide planting include eastern and Rocky Mountain red cedar, Austrian and ponderosa pine, bur oak, American and Chinese elm, and Russian-olive. Many other species are said to thrive in specific regions of the State. Data are presented on the potential growth of Kansas forests, requirements, and present rate of depletion. A comprehensive program for improvement is presented.

Timber farming in the Cloquet district, J. H. ALLISON and R. N. CUNNINGHAM (*Minnesota Sta. Bul. 343 (1939), pp. 35, figs. 17*).—Suggesting that present rates and methods of cutting are reducing the supplies of the more valuable species, the authors discuss the results of a study in a localized area of ways and means of improving the situation and promoting sustained production. Only 1.5 percent of the original forest area is in saw-timber and only 9.2 percent in cordwood stands. Much of the cut-over area is idle or occupied by inferior species. Owing to the depleted condition of the forests, local mills and wood-working plants obtain only about half their required material within the district. With proper methods and conditions, most of the necessary lumber could be produced. The obstacles to development include an unfavorable tax system, lack of technical leadership, inadequate financing, and low prices. There is need of demonstration forests, forestry instruction in high schools, a bonus for wood produced under scientific methods, transfer of delinquent lands to State forests, and the scaling down of taxes in accordance with the income-producing power of the lands.

A three-dimensional lattice design for studies in forest genetics, B. B. DAY and L. AUSTIN. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 59 (1939), No. 2,*

pp. 101–119, figs. 3).—Herein is discussed the application of the design to the testing of a large number of seed selections or strains of ponderosa and Jeffrey pines. To satisfy the initial requirement that the number of varieties be a perfect cube, there were included 729 individual lots of seed. The effectiveness of the experimental plan for eliminating differences in yield or measurements due to soil heterogeneity or differential treatments was demonstrated. The effect on germination dates of a known variable, namely, time of watering, was also studied and was found to give further evidence that the lattice design eliminates the effects of plat differences upon the average values, whether they are initial or of somewhat later occurrence (such as watering).

The solvent distillation method for determining the moisture content of forest litter, C. C. Buck and J. E. Hughes. (U. S. D. A. and Univ. Calif.). (*Jour. Forestry, 37 (1939), No. 8, pp. 645–651, figs. 4*).—A xylene distillation method is described which permits the standardization of moisture measurements to a degree not readily attainable by methods in common use. Furthermore, the new method has the advantage of rapidity, a factor especially valuable where the results are needed promptly.

Multiple use sprayer for the application of liquid fertilizers, insecticides, and soil disinfectants in forest nurseries, W. H. Brener (*Jour. Forestry, 37 (1939), No. 8, pp. 630, 631, fig. 1*).—A mechanical sprayer is described which makes possible the application of liquid fertilizers, insecticides, and soil disinfectants at low cost.

Preembryonic selection in the pines, W. P. Stockwell. (U. S. D. A.). (*Jour. Forestry, 37 (1939), No. 7, pp. 541–543, figs. 4*).—This is a discussion of the processes of pollination and fertilization and embryogeny in the pine.

Some effects of the 1936 drought on the forest at the Cloquet Forest Experiment Station, T. Schantz-Hansen and P. N. Joranson. (Univ. Minn.). (*Jour. Forestry, 37 (1939), No. 8, pp. 635–639*).—Following a very severe drought in the summer of 1936, observations were made on coniferous stands in and near the Cloquet Forest. Significant decreases were recorded in the surface area of the needles produced by jack, Norway, and northern white pines in 1936 as compared with 1935. On the other hand, the length, and probably the surface area, of balsam fir and black spruce needles were not reduced by the drought. A stand of Norway and northern white pines ranging from 30 to 40 ft. in height and located on thin soil underlain by rock suffered severe mortality, with nearly all the Norway pines dying. It was evident in the case of the three pines that the size and development of the needles is dependent on the growing conditions in the year in which they are produced.

Soil freezing as affected by vegetation and slope aspect, B. C. Goodell. (U. S. D. A.). (*Jour. Forestry, 37 (1939), No. 8, pp. 626–629, fig. 1*).—Studies in Hardin County, Ill., on three pairs of selected sites showed that freezing occurs frequently and to appreciable depths in pasture and cornfield soils when, at the same time, no freezing occurs in comparable forest-covered soils. Freezing was considerably deeper on a northern slope than on a comparable southern exposure. The greater capacity for forest-covered soils to absorb run-off during cold weather is indicated.

Plant competition in forest stands, C. F. Korstian and T. S. Coile (*Duke Univ., School Forestry Bul. 3 (1938), pp. 125, pls. 13, figs. 58*).—Observations on several pairs of plats established under comparable forest conditions but one of each pair trenched deeply to exclude entering roots showed marked changes in the vegetation following trenching. There was an increase in the number of species, total plants, and luxuriance of the growth. Since soil moisture was significantly more abundant in the trenched plats, and since there

was no material difference in light intensity or in the N. C, nitrates, or ammonia contents in the upper 5 in. of soil between the plats, the authors conclude that soil moisture is the principal operating factor. Under natural conditions, soil moisture probably determines largely the character of reproduction under forest canopies.

Improvement cuttings in shortleaf and loblolly pine, R. R. REYNOLDS. (U. S. D. A.). (*Jour. Forestry, 37 (1939), No. 7, pp. 568–570*).—From the results of studies of large-scale improvement cuttings on the Crossett (Ark.) Experimental Forest, the author concludes that such cuttings may not only return an immediate profit but leave the stands in condition to produce later a greater volume of higher-grade materials.

Increased growth of loblolly pine as a result of cutting and girdling large hardwoods, H. BULL. (U. S. D. A.). (*Jour. Forestry, 37 (1939), No. 8, pp. 642–645, figs. 2*).—A study of a loblolly pine stand near Urania, La., in which large hardwoods were cut or girdled, revealed that the basal area increased 75.4 percent on the improvement plats and only 21.6 percent on the controls. Pulpwood volume increased 82 percent on the improvement plats and only 33 percent on the controls. Girdling costs were apparently offset by increased growth of the first 5 yr., with prospects of greater differences as time advanced.

Effects of fire and cattle grazing on longleaf pine lands as studied at McNeill, Mississippi, W. G. WAHLENBERG, S. W. GREENE, and H. R. REED. (Coop. Miss. Expt. Sta.). (*U. S. Dept. Agr., Tech. Bul. 683 (1939), pp. 52, pls. 5, figs. 10*).—Of four types of land treatment, namely, burned pasture, unburned pasture, burning without grazing, and no burning and no grazing, compared on longleaf pine lands ordinarily used for timber production as well as cattle grazing, none proved fully satisfactory, either from the standpoint of trees or cattle. Annual winter burning of uncontrolled intensity retarded the growth of longleaf pine saplings by about 20 percent in diameter and 25 percent in height development during a 5-yr. period. Older trees apparently were much more tolerant to fire, and cone yields were little if at all affected by burning. As to survival of seedlings that germinated during the investigation, the greatest number were counted on the unburned and ungrazed area and the least on the burned and grazed. None of the four treatments was successful in bringing new longleaf pine seedlings out of the grass stage. Annual defoliation by fire on the one hand and the prevalence of brown spot needle disease on the other are believed responsible for retarded growth. It is believed that some modified form of periodic burning, rather than fire exclusion or severe annual burning, is needed.

As to grazing, annual winter burning was favorable, resulting in more and better-quality forage. Without burning, the accumulation of pine litter and dead grass impeded the development of the pasture plants. The improvement in pasture by burning was shown in larger gains in weight by the cattle. Burning and grazing did not result in serious soil degradation. In fact, burned-over soils showed a somewhat more favorable chemical composition but possessed fewer favorable physical characteristics.

Fire Control Notes, [October 1939] (*U. S. Dept. Agr., Forest Serv., Fire Control Notes, 3 (1939), No. 4, pp. 11+45, figs. 11*).—This is the usual quarterly report.

A yield table for well-stocked stands of black spruce in northeastern Minnesota, G. D. FOX and G. W. KRUSE. (U. S. D. A.). (*Jour. Forestry, 37 (1939), No. 7, pp. 565–567*).—Stating that black spruce stands, if permitted to develop without disturbance by destructive agencies such as fire, tend to become

all-aged because of the tolerance of the seedlings to shade, the authors present yield and stand tables based on three crown classes—dominant and codominant, intermediate, and suppressed. The final tables were essentially composed of three separate sets of calculations and curves.

Forest products statistics of the Southern States, R. V. Reynolds and A. H. Pierson (*U. S. Dept. Agr., Statis. Bul. 69 (1939), pp. 106, figs. 4*).—Herein are offered data gathered in cooperation with the Bureau of the Census, U. S. Department of Commerce, and the Dominion of Canada Bureau of Statistics on lumber production, distribution, consumption, stumpage prices, log prices, lumber prices, naval stores, etc., for 11 Southern States.

DISEASES OF PLANTS

The Plant Disease Reporter, [September 1 and 15, 1939] (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 23 (1939), Nos. 16, pp. 267–283; 17, pp. 285–298, figs. 5*).—The following are included:

No. 16.—Notes on the occurrence of *Coleosporium* in the southeastern United States during 1938 and 1939, including an annotated list of hosts and rust species, by G. G. Hedgcock; sassafras yellows, an apparently new disease with symptoms resembling virus infections, by P. A. Young; occurrence of ashy stem blight on bean reported from Arkansas, by S. B. Locke; report on watermelon diseases in Florida in 1939, by M. N. Walker; potato diseases in New York; and brief notes on frogeye and wildfire on tobacco, and fruit diseases reported from Kentucky, foot rots of wheat in Kansas, wheat diseases observed in traveling through the western region, and bacterial disease (*Bacterium papavericola*) of poppies in Oregon.

No. 17.—Present status of the Dutch elm disease; a survey of bacterial wilt and ring rot of potatoes in Nebraska in the spring of 1939, by R. W. Goss and J. H. Jensen; distribution of bacterial ring rot of potato in the United States potato late blight and other diseases in New York; a survey of the occurrence of the bulb or stem nematode on onions in the State of New York, by A. G. Newhall, R. L. Clement, I. D. Smith, and B. G. Chitwood; *Choanephora* on peas, by J. L. Weimer and W. A. Jenkins; epidemic of bitter rot of apple in southern Illinois in 1939, by G. H. Boewe; and reduction in wheat yield in Illinois in 1938 due to the orange leaf rust, by L. R. Tehon.

Diseases of plants in the United States in 1937, J. I. Wood and N. W. Nance (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 1939, Sup. 110, pp. 153–319, figs. 35*).—Following a list of collaborators the subject matter is taken up under weather data (see p. 17), and under diseases, respectively, of cereals, forage and cover crops, special crops, fruits, nuts, trees, ornamental and miscellaneous plants, vegetables, and sugar plants.

1937 and 1938 additions and corrections to the list of causes of fungous and bacterial plant diseases in Maine, M. T. Hilborn and F. H. Steinmetz. (Coop. Maine Expt. Sta. and Univ.). (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 1939, Sup. 113, pp. 21–26*).—This includes additions to the list published in 1938 (E. S. R., 79, p. 490) and follows the same procedure.

Fruit and vegetable diseases on the Chicago market in 1938, G. B. Ramsey (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 1939, Sup. 114, pp. 27–40*).—"As in years past, these data were compiled from notes made on inspections of fresh fruits and vegetables as they arrived on South Water Market and at freight and express terminals, and from material abstracted from Federal inspections certificates issued by the Bureau of Agricultural Economics in Chicago. . . . Several unusual diseases observed on this market

for the first time . . . are *Phytophthora* rot of California asparagus, waxy break-down of California garlic, smudge and black rot of Texas Crystal Wax onions, and gray mold rot of California potatoes. Some field and market notes on the fall crop of California tomatoes are appended."

Market diseases of fruits and vegetables: Grapes and other small fruits, D. H. Rose, C. O. Bratley, and W. T. Pentzer (*U. S. Dept. Agr., Misc. Pub. 340* (*1939*), *pp. 27, pls. 10*).—This is the sixth in a series (E. S. R., 79, p. 643) designed to aid in recognizing and identifying economically important pathological conditions of fruits and vegetables in the channels of marketing, to facilitate market inspection, and to prevent losses from such troubles. The treatment of the material is similar to that previously employed.

A list of plant diseases recorded in New Zealand, R. M. Brien (*New Zeal. Dept. Sci. and Indus. Res. Bul. 67* (*1939*), *pp. 39*).—A list of 411 plant diseases recorded to date, including those of bacterial, fungus, virus, and physiological etiology.

Report of the 1939 annual meeting of the Pacific division of the American Phytopathological Society (*Phytopathology, 29* (*1939*), *No. 9, pp. 822-829*).—Abstracts of the following papers are included: Overwintering Mycelium of *Plasmopara viticola* (B & C) Berl. & DeT. in the California Wild Grape, *Vitis californica* Benth., by J. T. Barrett; Pathogenicity and Pathological Histology of *Phymatotrichum omnivorum* in a Woody Perennial, the Pecan, by L. A. Brinkerhoff; Spraying by Airplane for Disease Control in Peach Orchards, by P. D. Caldis; Morphological and Anatomical Features of Phyllody in Varieties of Tomato and Bean, by B. F. Dana; The Effects of Sea Spray Deposits on Spore Germination and Mycelial Growth of the Cypress Canker Fungus, by A. W. Dimock; Host Range and Strains of the Powdery Mildew (*Erysiphe polygoni*) of Bean and Cowpea, and Inheritance of Resistance to Powdery Mildew in Runner Beans (*Phaseolus coccineus*), Tepary Beans (*P. acutifolius*), Yard Long Beans (*Vigna sesquipedalis*), and Cowpeas (*Vigna sinensis*), both by B. Dundas; Additional Celery Viroses, by J. H. Freitag and H. H. P. Severin; Camellia Blossom Blight, by H. N. Hansen and H. Earl Thomas; Registration of Citrus Trees Inspected for Psorosis, by J. L. Hewitt; Transmission of Black-Raspberry Mosaic by the Cane-Feeding Aphid, *Amphorophora rubicumberlandi*, by G. A. Huber; The Occurrence of *Sclerotinia fructicola* and *S. laxa* on Stone Fruits in Western Washington, by G. A. Huber and K. E. Baur; The Effect of Calcium Cyanamid on Development of Apothecia of *Sclerotinia fructicola* and on Population of *Taeniothrips inconsequens* in Prune Orchards, by G. A. Huber, K. E. Baur, and E. P. Breakey; Virus Concentration in Root Tips of Resistant and Susceptible Sugar Beets, by C. F. Lackey; Breeding for Resistance in Blackeye Cowpeas in Cowpea Wilt, Charcoal Rot, and Root-Knot Nematode, by W. W. Mackie; The White Streak or White Stripe Disease of Narcissus, by F. P. McWhorter; The Efficacy of Some Insoluble Copper Sprays for the Control of Walnut Bacteriosis in Oregon, by P. W. Miller; Delphinium Aster Yellows, by H. H. P. Severin and S. J. Oliver; Culture Methods in Relation to *Fusarium* Identification, by W. C. Snyder and H. N. Hansen; The Effect of Intercrops and Forage Crops on the Incidence and Severity of *Phymatotrichum* Root Rot on Pecan, by R. B. Streets; Further Studies on the Control of *Phymatotrichum* Root Rot in the Pecan by Soil Treatments, by R. B. Streets and L. A. Brinkerhoff; The Stem Nematode Disease of Oats and Peas, by Harold E. Thomas; The Use of Carbon Bisulphide in the Control of *Armillaria* Root Rot, by Harold E. Thomas and L. O. Lawyer; Root Rot of *Ranunculus asiaticus* Caused by *Pythium debaryanum*, by C. M. Tompkins and J. T. Middleton; Evidence of Production of Antibody-like Substances

in Turkish Tobacco, *Nicotiana tabacum*, Infected With Curly-Top Virus, by J. M. Wallace; The Effect of Petroleum Oil Emulsion on the Fungicidal Value of Bordeaux Mixture, by E. E. Wilson; Attempts at the in vitro Culture of *Erysiphe polygoni* and *Peronospora destructor*, by C. E. Yarwood; and Stamen Blight of Blackberry Caused by *Hapalosphaeria deformans*, by S. M. Zeller.

Proceedings of local branches of the Society of American Bacteriologists (*Jour. Bact., 38 (1939), No. 2, pp. 234, 235, 236*).—Abstracts of the following papers are of interest to phytopathology: Plant Nutrition and Disease Resistance, by J. Naghski, R. G. Harris, D. E. Haley, and J. J. Reid, and The Relation of the Soluble Specific Substance to Virulence and Specificity in Bacterial Leafspot Organisms, by R. G. Harris, J. Naghski, M. A. Farrell, and J. J. Reid (both Pa. Expt. Sta.).

[Plant disease studies in North Carolina] (*North Carolina Sta. Rpt. 1938, pp. 14, 15, 23–25, 26–28, 30, 36–38, 43–45, figs. 6*).—Brief reports of progress are given on the following: Relation of chemical and soil factors to the wilt diseases of plants due to *Bacterium* (=*Phytomonas*) *solanacearum*, by A. Mehlich; further studies on the effect of soil treatment for the control of black shank of tobacco (*Phytophthora nicotianae*), and of Granville tobacco wilt (*B. solanacearum*), both by R. F. Poole; tobacco mosaic, and cotton seedling diseases and seed treatment, both by S. G. Lehman; *Fusarium* wilt of cotton, with respect to the possible existence of different biological forms, and the effect of potash on the control of the disease, by P. H. Kime and O. P. Owens; studies of the causes of root rot of peanuts (including isolations of many species and strains of fungi and tests for their pathogenicity), and further studies on the effects of fertilization and of various copper compounds on the control of bacterial spot of peaches due to *Bacterium* (=*Phytomonas*) *pruni*, all by Poole.

The use of special media for sporulation of fungi, D. J. and C. O. Smith. (Calif. Citrus Expt. Sta.). (*Phytopathology, 29 (1939), No. 9, p. 821*).—Leaf juice expressed from *Platanus racemosa* and sterilized by filtration (Chamberlain filters) was successfully used to induce abundant spermatial and conidial production by leaf spot fungi (*Stigmella platani-racemosae*, *Stigmina platani*, *Mycosphaerella platanifolia*, and *M. stigmina-platani*). It is suggested that this medium might favor the development of perfect stages.

Renewed liquid-cultures of fungi, R. E. Wean and J. E. Young. (Purdue Univ.). (*Phytopathology, 29 (1939), No. 10, pp. 895–898, figs. 2*).—Richard's solution cultures of *Pythium debaryanum* were renewed during a 10-day period by means of a flow-meter apparatus at the rate of 400 cc. per 24 hr. At full strength a suppression of growth resulted, while at ½, ⅛, and 1/32 an increase in growth occurred. The pH was maintained at the original 4.7 in the renewed solutions, while a drift to 6.72 occurred at 1/32 concentration in the controls.

Life cycles of smut fungi, K. Sampson (*Brit. Mycol. Soc. Trans., 23 (1939), pt. 1, pp. 1–23*).—This address presents a general account and review of the subject, with copious bibliography.

The electro-optical effect in certain viruses, M. A. Lauffer (*Jour. Amer. Chem. Soc., 61 (1939), No. 9, pp. 2412–2416, figs. 6*).—The Kerr electrooptical effect is reported to occur in solutions of tobacco mosaic, aucuba mosaic, and potato latent mosaic viruses. In dilute solutions in an alternating electric field of 60 cycles, the double refraction of tobacco mosaic virus appeared to be positive for all values of the field strength, but for more concentrated solutions the effect became negative in weak electric fields, passed through an inversion point for stronger fields, became positive for still stronger fields, and finally attained a maximum value. The inversion point occurred at higher field

strengths in more concentrated solutions. By bringing the virus nearer its isoelectric point, the negative effect was generally increased and the inversion point was shifted to stronger fields. Aging the virus had a similar effect. It is suggested that two opposing forces may control the orientation of the virus particles, which are discussed theoretically.

Spotted-wilt: Host range and transmission by thrips, E. E. CHAMBERLAIN and G. G. TAYLOR (*New Zeal. Jour. Sci. and Technol., 20 (1938), No. 3A, pp. 133A–142A, figs. 6*).—Greenhouse tests indicated that besides tomato and tobacco 20 species of 7 plant families are susceptible to spotted wilt in New Zealand, and spontaneously infected plants of 7 species were collected in the field. Under the test conditions the disease was transmitted by *Thrips tabaci*.

Recent developments in copper fungicides, A. A. NIKITIN (*Tenn. State Hort. Soc. Proc., 33 (1937), pp. 25–28*).

Damping-off control, J. G. HORSFALL (*New York State Sta. Cir. 186 (1939), pp. 16, figs. 3*).—General information on the significance, causes, and control (seed disinfection and protection, soil treatments, and cultural practices) of damping-off, and based on Bulletin 683 (E. S. R., 80, p. 496).

A summary of the cereal rust situation in Virginia in 1938, with notes on other cereal diseases, G. E. MATHENY (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 1939, Sup. 115, pp. 41–49, fig. 1*).—Included in this summary are tabulations of the dates of appearance of various stages of the cereal rusts on barberry, wheat, oats, rye, and barley (1934–38); precipitation and temperature data for March–July 1938; and stem rust infection on wheat and barley observed June 13, 25, and 26, 1938. Notes on leaf rusts and other cereal diseases are included.

Physiologic strains of bean rust, B. DUNDAS and G. W. SCOTT (*Phytopathology, 29 (1939), No. 9, pp. 820, 821*).—Two single-spore isolations of *Uromyces phaseoli typica* from Washington and Florida, respectively, were compared with the two previously described strains (E. S. R., 73, p. 795; 80, p. 635) of bean rust by inoculating plants in the field and in the greenhouse and on inoculated abscised leaflets floated bottom up on a 5-percent sucrose solution in petri dishes, the three test methods giving essentially identical results. The strains proved to differ from each other and from the two previously described strains.

Crazy top of corn, B. KOEHLER. (Ill. Expt. Sta.). (*Phytopathology, 29 (1939), No. 9, pp. 817–820, fig. 1*).—Crazy top of corn, the cause of which is unknown, is characterized by vegetative proliferations supplanting the floral organs. The upper part of the stem only may be deformed, or the ear shoots and all parts above them may be deranged. The disease has been observed in Indiana, Illinois, and Iowa, and its occurrence in a field was always spotted, coinciding consistently with depressions in the field. In one of the areas of affected corn two grasses (*Echinochloa crusgalli* and *Setaria viridis*) were somewhat similarly affected.

Cross protection tests with two strains of cucumber-mosaic virus, W. C. PRICE (*Phytopathology, 29 (1939), No. 10, pp. 903–905, fig. 1*).—A close relationship between Doolittle's and Porter's cucumber mosaic viruses is indicated by comparing their symptomatology, host range, and properties. However, this relationship has been questioned by Chester's failure to obtain a serological reaction between the two. It was found by the present study that leaves of *Zinnia elegans* mottled by Doolittle's virus are completely protected from Porter's virus (No. 6 strain). In spite of their serological differences, it is therefore concluded that these viruses should be classified in the same group.

Effect of crown and stem rusts on the relative cold resistance of varieties and selections of oats, H. C. MURPHY. (Iowa Expt. Sta. and U. S. D. A.).

(*Phytopathology*, 29 (1939), No. 9, pp. 763–782, figs. 4).—Infection during the hardening period with crown (*Puccinia coronata avenae*) or stem (*P. graminis avenae*) rusts, or shading, reduced the capacity for juvenile greenhouse-grown oats to become hardened against freezing injury. The loss in cold resistance due to rust became greater with increases in severity of infection or degree of exposure. Plants at the 4-leaf stage proved less resistant to cold, whether infected or rust-free, than equally hardened plants at the 6-leaf stage. The hardiness index of 21 varieties infected with 20–80 percent of crown rust was 13–68 percent lower than similarly treated rust-free plants. Stem rust infections of 15–85 percent lowered the cold resistance of the same group 9–91 percent. Shading with gauze during hardening lowered the cold resistance of the varieties. Shading resulting from extraneous rust spores did not appear to be a major factor in lowering cold resistance of infected plants. Watering oat plants with a 1-percent solution of $NaNO_3$ or NaCl previous to freezing had a hardening effect somewhat greater than that from exposure to 38°–40° F. More concentrated solutions tended to injure the plants similarly to exposure to freezing temperatures. However, repeated experiments indicated that injury from salt solution may not be a reliable index of relative cold resistance. The average hardiness indexes of varieties and selections included in 43 freezing tests are presented.

Comparative studies of the bacteria associated with potato blackleg and seed-piece decay, R. Bonde. (Maine Expt. Sta.). (*Phytopathology*, 29 (1939), No. 10, pp. 831–851).—The author reports morphological, physiological, and pathological studies of 62 pathogenic bacterial strains associated with potato blackleg, seed-piece decay, and other soft rot diseases. The fact that bacteria capable of causing blackleg and soft rot were secured from widely different sources lends support to the view that this disease may often originate from contamination after the seed tubers have been cut, rather than from systemic infection. Blackleg cultures from the various sources were identical in all physiological characteristics except as to gas production on dextrose, sucrose, and lactose and as to indole production, but they varied in pathogenicity for potato stems and seed pieces. It is concluded that the causal agents of potato blackleg, as well as of soft rots found in various host plants, are strains of *Erwinia carotovora*. The blackleg organism was found intimately associated with certain insects commonly present in decaying plant tissues and was proved capable of remaining viable over winter in Maine within the puparia of the cabbage maggot. Other bacterial pathogens, not previously described, but found to be causal agents of seed-piece decay in Maine and South Carolina, were studied and their characteristics given.

Experiment station working to eliminate bacterial wilt of potatoes in Colorado, C. H. Metzger, W. A. Kreutzer, and D. P. Glick (*Colo. Farm Bul.* [*Colorado Sta.*], 1 (1939), No. 3, pp. 8, 9).—Experimental work to date is said to indicate that the chief method of spread of this disease occurring in all parts of the United States and Canada is through the seed and that there is no evidence of its spread by the soil. A program is under way to produce disease-free seed foundation stock of the varieties commonly grown in Colorado.

Effects of fertilizer on stem rot of rice, E. M. Cralley (*Arkansas Sta. Bul.* 383 (1939), pp. 17, fig. 1).—First described in Italy (1876), this disease (sclerotial stage, *Sclerotium oryzae*; conidial stage, *Helminthosporium sigmoideum*; perfect stage, *Leptosphaeria salvinii*) has since been reported from numerous countries, including the United States. The experiments here described were initiated when it was observed that losses from this trouble were affected by

the type of growth of the host. The sclerotia were found to cause the major portion of the infections. Considering the field tests as a whole, nitrogen applied in sufficient amounts significantly increased both yields and disease indexes—a high disease index signifying severe infection. Phosphorus, in general, produced moderate increases in yield and also tended to increase the stem rot indexes, but the increases in either case were not as large as those induced by high N. Applications of N and P, for the most part, produced higher yields and indexes when combined than separately. In general, potash was only slightly beneficial in increasing yields. Used alone it did not increase the disease indexes, and in combination with N and P it was instrumental in maintaining the indexes on a level equal to or sometimes below those of the controls. It thus appeared that for improving yields on infested land sufficient K should be added to the fertilizer to minimize losses from stem rot.

Greenhouse tests, in general, supported the field results. Using a sand-culture technic, very high disease indexes were obtained on plants grown in unbalanced solutions (high N and low K). With N and P levels constant, stem rot severity decreased as the K level was increased.

Downy mildew of spinach and its control, M. C. Richards (*[New York] Cornell Sta. Bul. 718 (1939), pp. 29, figs. 10*).—More than 26 plant species in 5 families have been reported in the literature as suscepts of *Peronospora spinaciae* (the accepted name of the pathogen). However, the results of this study suggest that the host range is limited to the genus *Spinacia*, and the author found 35 spinach varieties to be equally susceptible to this important disease. Spinach mildew has been reported from nearly every country where the host is grown and has been found in 24 States in this country, where it is said to cause losses of 3–15 percent of the crop each year. The symptoms are yellowing, stunting, and necrosis of infected parts. The morphology of the fungus was studied in detail, and it was found to differ from the downy mildew fungi on other chenopodiaceous hosts. Primary inoculum may come from infected or infested seeds, infested soil, or overwintered infected plants, the latter being important under Long Island conditions. Wind and rain are said to be the important inoculating agents. The factors influencing conidial germination were studied. With favorable temperatures infection may occur in less than 3 hr. after inoculation, while fruiting of the fungus will not occur in less than 6 days at 60°–70° F. and relative humidities of 85 percent or above are necessary. Epidemics of the disease resulted under a combination of the following conditions: When inoculated plants were in a vigorous growing condition, abundant conidia were produced so that many plants were inoculated simultaneously, mean temperatures of 45°–65° were maintained for 7 or more days, water was present on the leaves for 3 hr. or longer, and high relative humidities existed during infection and fungus fruiting. Control by isolation of the overwintered spinach plants from the winter- and spring-sown crops is suggested for Long Island conditions. Use of copper fungicides as protectants and the selection of spinach varieties for resistance proved unsuccessful. There are over 3 pages of references.

Studies on dry-rot canker of sugar beets, E. L. LeClerg. (Minn. Expt. Sta. and U. S. D. A.). (*Phytopathology, 29 (1939), No. 9, pp. 793–800, figs. 2*).—Some of the factors influencing the development of dry rot cankers and the comparative morphology, physiology, and pathogenicity of various *Rhizoctonia* isolates from them were studied. Comparisons were also made of isolates inducing the dry rot canker with those causing *Rhizoctonia* crown rot of sugar beets and those attacking potatoes. The average diameter of the hyphae

of six day rot canker isolates was 7.4–8μ. Radial growth of the crown rot group of isolates on media was greater than that of the dry rot canker and potato groups. Growth was most rapid for all three groups on potato dextrose agar, less rapid on low-nitrogen agar, and slowest on high-nitrogen agar. The optimum temperature for radial growth of the dry rot canker and crown rot isolates was 30° C., while for the potato isolates it was 25°. The dry rot canker fungus was most active in causing decay of sugar-beet roots at soil temperatures of 30°–35°, and was favored by relatively low soil moistures. Comparative pathogenicity tests on several economic crop plants are reported. It appears that the dry rot canker isolates from sugar beets differ in many respects from the crown rot isolates, but until the perfect stage of the former is found it is deemed advisable to maintain the species designation as suggested by Richards (E. S. R., 46, p. 147).

Four fungus parasites of sweetclover infecting seed, F. R. Jones. (U. S. D. A. and Wis. Expt. Sta.). (*Phytopathology, 29 (1939), No. 10, pp. 912, 913*).—The following fungi were cultured from viable sweetclover seed: *Ascochyta caulicola, Cercospora zebrina, Leptosphaeria pratensis,* and *Mycosphaerella lethalis.*

Evidence of resistance in sweetclover to a Phytophthora root rot, F. R. Jones. (U. S. D. A. and Wis. Expt. Sta.). (*Phytopathology, 29 (1939), No. 10, pp. 909–911*).—An early spring root rot of sweetclover, due to *Phytophthora megasperma,* is reported as occurring from Ohio northward into Wisconsin. Resistant plants were found chiefly in a strain of *Melilotus alba.* When selfed they gave populations with high percentages of resistant plants in artificial tests.

Injury to tobacco leaves by water-soaking, W. D. Valleau, S. Diachun, and E. M. Johnson. (Ky. Expt. Sta.). (*Phytopathology, 29 (1939), No. 10, pp. 884–890, figs. 3*).—Tobacco leaves water-soaked and kept in that condition for 24 or 48 hr., the time claimed as necessary to produce epidemic wildfire and blackfire if inoculated with the respective organisms, were found likely to show extensive injury either at the end of the period of water-soaking or during the next few days in the absence of infection. When the water-soaked tissues were inoculated, the injury resulting bore no resemblance to the blackfire field injury occurring on maturing dark tobacco. Water-soaking thus appears to play little if any part in blackfire outbreaks as they occur on maturing dark tobacco in Kentucky.

Reinoculation of resistant varieties of wheat with purified physiologic races of *Tilletia tritici* and *T. levis*, W. M. Bever. (U. S. D. A. and Idaho Expt. Sta.). (*Phytopathology, 29 (1939), No. 10, pp. 863–871*).—In a 3-yr. experiment, six purified physiologic races of *T. tritici,* three of *T. levis,* and a species hybrid were used to determine the infection percentage obtained by repeated reinoculation of a resistant variety with its own bunt. Cross-inoculations were also made to compare the effect of inoculating a resistant variety with bunt from a susceptible one and to determine the viability of the inoculum. Each race was inoculated from (1) a susceptible to a susceptible variety, (2) a susceptible to one or more resistant varieties, (3) a resistant to a resistant variety, and (4) a resistant to a susceptible variety. The infection percentage varied from year to year, depending largely on environal conditions, but the results indicated that when a purified physiologic race is used the amount of infection resulting from the reinoculation of a resistant variety with its own bunt is not significantly higher than when inoculated with the same race from a susceptible variety. In the case of the species hybrid there was an increase of infection each year on Turkey wheat, indicating that the race to which this

variety was resistant was being strained out, so that a concentration of the inoculum to which it was susceptible had occurred, thus resulting in higher infection percentages.

Important fruit tree diseases of Ontario, J. E. Howitt and R. E. Stone (*Ontario Dept. Agr. Bul. 403* (*1939*), *pp. 51, figs. 32*).—A handbook referring particularly to diseases of pome and stone fruit trees and their control.

Phytophthora trunk canker or collar rot of apple trees, R. C. Baines. (Ind. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *59* (*1939*), *No. 3, pp. 159–184, pl. 1, figs. 4*).—These studies were initiated following a severe epidemic of collar rot in Indiana (1933). Evidence from the literature (48 references) indicated that losses of Grimes Golden trees from this disease in the State probably occurred as early as 1900. *P. cactorum* was found to be the cause, and data obtained relative to its pathogenicity and physiological specialization, the host symptoms, resistance and susceptibility, and means of control are presented. Mycelium develops inter- and intracellularly, penetrating all the bark tissues, and pathogenic cultures were obtained from active cankers, infected fruits, sapwood beneath a canker, and from orchard soil. The Gano, Grimes Golden, Tompkins King, Northwestern Greening, Rome Beauty, Smokehouse, and Stark varieties proved susceptible to one or more of the physiological races of *P. cactorum* isolated, and certain cultures were pathogenic on cherry, peach, and plum trees, and on flax and peony shoots. All 29 varieties of apple fruits tested were successfully inoculated. Grimes Golden trees 2–4 yr. old proved highly resistant to infection, while trees 8–30 yr. old were highly susceptible. In the field, the disease was seldom encountered on trees less than 13 yr. old. Trunks of Grimes Golden were readily infected, but the large branches only occasionally. The component varietal portions of double- and high-grafted trees retained their specific reactions to the fungus, and high grafting of Grimes Golden scions proved inadequate for preventing infection. Bordeaux mixtures (16–16–100 and 30–30–100) gave partial control of collar rot, and a 10-percent solution of sodium arsenite in 50-percent alcohol gave promise as an effective check to established cankers.

Pathogenicity, symptoms, and the causative fungi of three apple rusts compared, P. R. Miller (*Phytopathology, 29* (*1939*), *No. 9, pp. 801–811, figs. 3*).—The evidence assembled is deemed to indicate that cultivated apples in the eastern part of the United States have been affected for some time by three rusts, viz, the "apple rust" (*Gymnosporangium juniperi-virginianae*), "hawthorn rust" (*G. globosum*), and "quince rust" (*G. clavipes*). The last two were for the most part not recognized as distinct apple diseases by early workers, and this situation is believed to account for much of the diversity of opinion relative to apple varietal susceptibility expressed in the literature. The comparative symptomatology of these diseases and the morphological characters of the pathogens are tabulated as diagnostic aids.

Effect of spray materials on leaf area of apples and cherries, H. C. Young. (Ohio Expt. Sta.). (*Ohio State Hort. Soc. Proc., 72* (*1939*), *pp. 44–48*).—The experiments reported confirmed the work of others in indicating a serious degree of leaf stunting on both apples and cherries when sprayed with lime-sulfur. Comparative tests of lime-sulfur and flotation sulfur gave far less reduction in leaf area for the latter. Fortunately lime-sulfur is not needed for cherries, since most of the fixed coppers (3–3–100) controlled leaf spot and caused very little injury or stunting. The situation is not quite so good for apples, but flotation sulfurs cause very little injury or stunting and usually control scab.

Leaf-spot of black cherry, R. E. Wean. (Purdue Univ.). (*Ind. Acad. Sci. Proc.*, *54* (*1938*), *pp. 48, 49, fig. 1*).—Using the *Cylindrosporium* stage of the *Coccomyces* fungus, "upper leaf-surface inoculations yielded an average of 18.2 lesions per leaf, while upon those of under-surface treatment there were 85.3 lesions per leaf." It follows that particular care should be taken to secure good coverage of the lower leaf-surface, bordeaux mixture and copper phosphate being two sprays that gave favorable results without injury.

The control of cherry leaf spot, H. C. Young and H. F. Winter (*Ohio Sta. Bimo. Bul. 199* (*1939*), *pp. 100–103*).—Previous to 1937 three applications of liquid or dry lime-sulfur were considered the standard material to use, but according to spray tests of 1937 and 1938 the sulfurs failed when the disease was severe, and the standard material (lime-sulfur) not only failed to control the disease but also dwarfed the leaves. The copper compounds proved effective and when used with lime were safe. Three lb. of a fixed copper (based on 25 percent metallic Cu) and 3 lb. of hydrated lime to 100 gal. of water are recommended as a safe and effective spray for sour cherries.

A destructive bud-transmissible disease of sour cherry in Wisconsin, G. W. Keitt and C. N. Clayton. (Univ. Wis.). (*Phytopathology*, *29* (*1939*), *No. 9, pp. 821, 822*).—An unfruitful condition of *Prunus cerasus*, called "physiological yellow leaf," is said to be widespread in Wisconsin. Reciprocal budding tests between affected and healthy Montmorency trees resulted in its transmission, controls showing no disease symptoms. Microscopic examinations and platings gave no evidence of a causal fungus or bacterium, the results obtained evidently indicating the disease to be due to a virus.

Removal of diseased trees is only known method of halting peach mosaic ravages, E. W. Bodine. (Coop. U. S. D. A. et al.). (*Colo. Farm Bul.* [*Colorado Sta.*], *1* (*1939*), *No. 2, pp. 8–10*).—The spread of mosaic, said to be the most serious disease of peaches in Colorado, is reported to have been checked in Mesa County by extensive destruction of infected trees. Its varying symptoms, differing development periods, *Prunus* species carriers, and symptomless carriers are reviewed. Inspections of orchards for symptoms and removal of mixed variety carriers are recommended control measures.

Persimmon wilt, R. K. Beattie. (U. S. D. A.). (*Tenn. State Hort. Soc. Proc.*, *33* (*1937*), *pp. 56–60*).—A further note on the *Cephalosporium* disease previously referred to (E. S. R., 81, p. 232).

Leaf variegation in strawberries not considered a virus disease, G. W. Darrow. (U. S. D. A.). (*Tenn. State Hort. Soc. Proc.*, *33* (*1937*), *pp. 41–48*).—A yellowing or leaf variegation, the exact cause of which is unknown, is reported to have become recently serious in certain strawberry varieties and to have a rather widespread distribution in the United States and Canada. The evidence from various sources appears to be rather conclusive as to its noninfective nature, and increasing evidence favors a genetic origin. The use of varieties in which the genes for yellowing are absent and an understanding of the method of inheritance are suggested as possible methods for the origination of nonyellowing varieties.

Methods of applying sodium bisulphite to grape packages for mold control, W. T. Pentzer. (U. S. D. A.). (*Blue Anchor*, *16* (*1939*), *No. 7, p. 2*).—The author briefly describes the methods of commercial application found most satisfactory after several seasons' trials.

Infectious variegation of citrus, H. S. Fawcett and L. J. Klotz. (Calif. Citrus Expt. Sta.). (*Phytopathology*, *29* (*1939*), *No. 10, pp. 911, 912, fig. 1*).—A condition of lemon leaves resembling certain variegations on ornamentals

was transmitted to sour orange stocks by budding. A partial resemblance to the infectious chlorosis described by Petri[3] is noted. The flecking of young leaves suggests a relationship to psorosis.

Lesions on Quercus laurifolia similar to those of leprosis on citrus in Florida, H. S. FAWCETT and A. S. RHOADS. (Calif. Citrus and Fla. Expt. Stas.). (*Phytopathology, 29 (1939), No. 10, pp. 907, 908, fig. 1*).—Lesions on this oak closely resembling those of leprosis on citrus were found in several Florida locations in 1932, in each case occurring in proximity to the citrus disease. It is suggested that the lesions on oak and citrus may possibly be due to the same cause.

Gladiolus diseases and their control, A. J. HICKS (*Prov. Quebec Gladiolus Soc. Yearbook, 1937, pp. 47–49*).—The salient points regarding some of the most common and destructive diseases and their control are briefly noted.

Rust on Jasminum grandiflorum, M. J. THIRUMALACHAR (*Phytopathology, 29 (1939), No. 9, pp. 783–792, figs. 3*).—*Uromyces hobsoni*, an autoecious rust on *J. grandiflorum*, causes hypertrophy of leaves, stems, and flowers, three sorus forms (aecia, pycnia, and telia) occurring side by side on hypertrophied portions. Uredia are absent, but aecial development proceeds almost throughout the season and telia develop within the old aecial cups from their base. Pycnia have rarely been reported, but numerous examples have now been examined and in many cases aecia and telia were seen to develop within the pycnial cup. On germinating, aeciospores produce a 2-cell germ tube with 1–2 whiplike structures which are not sterigmata but rather of the nature of appresoria. Teliospores germinate without rest, forming 3–4 binucleate basidiospores. Formation of secondary and tertiary sporidia was observed. Infection tests with aeciospores are described. The whiplike structure developed on the germ tube enters the stoma, and as a result of infection secondary aecia are formed. The mycelium associated with pycnia and the basal cells of the pycnia are binucleate. The binucleate condition is found in the aecial initials, aecial mycelium, and basidiospores.

White streak, a virus disease of narcissus, F. A. HAASIS. (Cornell Univ.). (*Phytopathology, 29 (1939), No. 10, pp. 890–895, fig. 1*).—The white streak virus, found to be mechanically transmissible, is considered to differ from the mosaic virus of narcissi (based on symptom expressions), but observational evidence supports the view that the two may be closely related. The only method as yet known for control consists in eradicating diseased and isolating healthy plants.

The Penicillium disease of ornamental palms, D. E. BLISS. (Calif. Citrus Expt. Sta.). (*5. West. Shade Tree Conf., Sacramento, 1938, Proc. Ann. Mtg., pp. 20–27*).—Three diseases of palms—leaf base rot of *Phoenix canariensis*, bud rot of *Washingtonia filifera*, and trunk canker of *Cocos plumosa*, all found due to *Penicillium vermoeseni*—are, generally speaking, said to occur in a rather narrow strip of land extending along the California coast from Mexico to the region of San Francisco Bay. Pending better means of control, planting of *W. filifera* in coastal regions is discouraged, but *W. robusta* may be substituted for it. The Canary date palm is attacked somewhat less frequently, but adequate control measures are also lacking. On *C. plumosa* the malady can be controlled if the trunk cankers are removed at an early stage.

The detrimental effect of walnut to rhododendrons and other ornamentals (*New Jersey Stas. Nursery Disease Notes, 11 (1938), No. 4, pp. 13–16*).—Report

[3] Bol. R. Staz. Patol. Veg. [Roma], n. ser., 11 (1931), No. 2, pp. 105–114, pl. 1, figs. 3.

of a case of poisoning of *Rhododendron catawbiense* by black walnut, with observations on similar effects on other ornamentals.

The diagnosis of tree diseases, W. W. Wagener. (U. S. D. A.). (*5. West. Shade Tree Conf., Sacramento, 1938, Proc. Ann. Mtg., pp. 28–34*).—A general discussion of the subject.

History of chestnut blight in Illinois, H. W. Anderson (*North. Nut Growers Assoc. Proc., 29 (1938), pp. 78–82*).—This brief account of the disease in the State since its first discovery there in 1925 deals with its present known distribution, theories as to its origin, and a summary of efforts at eradication.

The development of blight resistance in hybrid chestnuts, A. H. Graves (*North. Nut Growers Assoc. Proc., 29 (1938), pp. 31–36, fig. 1*).—This is a progress report, including a list of new chestnut hybrids. After 3 years' testing, the Japanese American hybrids on the whole have proved susceptible, but two of them are said to have shown absolute resistance, as well as two trees of *Castanea mollissima* and one of *C. crenata*. In general, the Chinese chestnuts have been the most resistant of all the trees under test.

Methods and progress in Dutch elm disease eradication, E. G. Brewer. (U. S. D. A.). (*5. West. Shade Tree Conf., Sacramento, 1938, Proc. Ann. Mtg., pp. 55–60*).

The Dutch elm disease in the United States and its insect vectors, C. May and C. W. Collins. (U. S. D. A.). (*5. West. Shade Tree Conf., Sacramento, 1938, Proc. Ann. Mtg., pp. 49–54*).—A summary of present information, including the history of the disease in the United States.

Progress in the control of elm diseases in nurseries, J. C. Carter (*Ill. Nat. Hist. Survey, Biol. Notes No. 10 (1939), pp. 19, figs. 2*).—A progress report relative to the control of leaf and wilt diseases of elms.

The relation of aeciospore germinability and dissemination to time of infection and control of Gymnosporangium juniperi-virginianae on red cedar, P. R. Miller. (U. S. D. A.). (*Phytopathology, 29 (1939), No. 9, pp. 812–817, figs. 2*).—Differential infection of red cedar trees exposed and covered in monthly relays over a 10-mo. period indicated maximum aeciospore dissemination to occur in July, August, and September. In tests over a 4-yr. period aeciospore germinability was lowest in summer when the spores were first released and highest in late winter. Fall inoculations of 25 red cedar trees resulted in several large galls on the stems of 1 tree. An equal number of spring inoculations, with overwintered spores from the same source, gave numerous small galls attached to the leaves on all the experimental trees. The place of infection may be determined by the relative susceptibility of leaf and stem tissues in fall and spring. Preliminary experimental data suggest the possible effectiveness of a dormant spray for prevention of infection on ornamental junipers.

Keys to the species of Ribes occurring in the Great Lakes region, H. T. Darlington and L. B. Culver (*Michigan Sta. Cir. 170 (1939), pp. 24, figs. 13*).—A winter key based on stem and twig characters, a summer key based on leaves, flowers, and fruits, and descriptions of 14 species are included. Extensive investigations are said to have shown that practically all *Ribes* species in this region are susceptible to the white pine blister rust (*Cronartium ribicola*), though with marked differences in degree.

Further studies on temperatures necessary to kill fungi in wood, M. S. Chidester. (U. S. D. A.). (*Amer. Wood-Preservers' Assoc. Proc., 35 (1939), pp. 319–324, figs. 2*).—Continuing these studies (E. S. R., 78, p. 656), data are presented on the effects of temperatures of 104°–212° F. on six wood-destroying

fungi growing in wood, the recommendations made being the same as the previous ones except that the period at 150° has been increased from 60 to 75 min. due to the longer time necessary to kill *Lenzites trabea*, included in the later tests. The requirements expressed are said to be amply fulfilled by ordinary commercial treatments of green wood with temperatures of preservative above 150°, but the results appear to indicate the impracticability of attempting to sterilize wood at internal temperatures below 150°

Effect of blue stain on the penetration of liquids into air-dry southern pine wood, R. M. LINDGREN and T. C. SCHEFFER. (U. S. D. A.). (*Amer. Wood-Preservers' Assoc. Proc., 35 (1939), pp. 325–336*).—The absorption of water and creosote by matched, air-dry stained and unstained blocks and large segments of similarly prepared southern yellow pine poles was studied, the stain being produced by three common fungi. Water absorption during 0.5–55 hr. was substantially greater in blocks stained by *Endoconidiophora moniliformis*, *Graphium rigidum*, and *Hormonema* sp. than in control blocks, the differences being greatest with the first and last fungi. No relation was noted between amount of discoloration and degree of absorption, and the increased water uptake by stained wood was limited largely to the first half-hour of soaking. Creosote absorption as a hot-and-cold bath and as pressure treatment was 110–150 percent greater in wood stained by *Ceratostomella pilifera* than in the controls, penetration of the sapwood being complete only in the stained wood. However, such large differences would not necessarily be expected in commercial practice. Increased porosity of stained wood resulting from partial breakdown of the ray parenchyma, together with some direct penetration of tracheid walls, is believed to be an important factor in its greater penetrability. The results presented are not intended as an argument for favoring use of air-dry stained wood in commercial practice, bright wood being considered preferable whenever a choice exists. Likewise, the results with air-dry wood cannot be considered as indicative of differential absorption tendencies in green or partially seasoned wood.

Acceleration of toximetric tests of wood preservatives by the use of soil as a medium, J. LEUTRITZ, JR. (*Phytopathology, 29 (1939), No. 10, pp. 901–903*).—During experiments with termite colonies exceedingly rapid decay was observed in soil-covered wood. Controlled tests gave evidence that moisture control obtained by the use of soil is primarily responsible for the uniform, rapid decay of southern pine sapwood (*Pinus echinata*) inoculated with pure cultures of the common wood-destroying fungi. Further studies may reveal the role of other factors, especially the effect of nutrilites of organic and inorganic nature.

Environmental factors and the wasting disease of eelgrass, N. E. STEVENS. (Univ. Ill.). (*Rhodora, 41 (1939), No. 487, pp. 260–262*).—The author summarizes meteorological data against the theory that a deficiency in sunshine is responsible for the decrease in eelgrass (*Zostera marina*) along the Atlantic seaboard, but thinks that the suggestion that variations in salinity may, through their effect on the development of the *Labyrinthula* parasite, influence the wasting of this water plant warrants further study.

The eelgrass situation on the American Pacific coast, C. COTTAM. (U. S. D. A.). (*Rhodora, 41 (1939), No. 487, pp. 257–260*).—Following the abrupt and unprecedented diminution of eelgrass (*Zostera marina*) on the Atlantic coast, the author states, on the basis of information from many sources, that "we have no authentic data indicating any disease or reduction of eelgrass along the Pacific coast."

ECONOMIC ZOOLOGY—ENTOMOLOGY

[Contributions on wildlife] (*Jour. Wildlife Mangt., 3 (1939), No. 3, pp. 180–200, 203–239, 255–278, pls. 9, figs. 14*).—Among the contributions on wildlife are Coyote Food Habits on the Lava Beds National Monument, by R. M. Bond (pp. 180–198); A Method for Determining the Relative Abundance of *Microtus pennsylvanicus*, by R. J. Greffenius (pp. 199, 200); A Local Study of Predation Upon Hares and Grouse During the Cyclic Decimation, by M. Morse (pp. 203–211); Winter Habits of Michigan Skunks, by D. L. Allen (pp. 212–228); The Evolution of Predator Control Policy in the National Parks, by V. H. Cahalane (pp. 229–237); Marking Birds by Imping Feathers, by E. G. Wright (pp. 238, 239): The Need for Data Relative to the Occurrence of Hydatids and of *Echinococcus granulosus* in Wildlife, by W. A. Riley (pp. 255–257) (Minn. Expt. Sta.); Infection of Cottontail Rabbits by *Cysticercus pisiformis* (*Taenia pisiformis*), by S. C. Whitlock (pp. 258–260); Age Determination in Quail, by A. S. Leopold (pp. 261–265) (Univ. Calif.); Plant Histology as an Aid in Squirrel Food-Habit Studies, by L. L. Baumgartner and A. C. Martin (pp. 266–268) (Ohio State Univ. and U. S. D. A.); and Relation Between Take of Upland Game and Agricultural Land Use in Connecticut, by A. E. Moss (pp. 269–278) (Conn. State Col.).

Food of ducks and coots at Swan Lake, British Columbia, J. A. Munro (*Canad. Jour. Res., 17 (1939), No. 8, Sect. D, pp. 178–186*).—A study made of autumn food habits of ducks and coots, based on the examination of 136 stomachs and on correlated field work, is reported. Findings led to the conclusion that "pond ducks had eaten 78 percent plant material, 12 percent *Chara*, and 10 percent animal organisms, [and] the food of diving ducks was 65 percent plant material (31 percent *Chara*), and 15 percent animal matter, while that of coots was 97 percent *Chara* and 3 percent plant material. *Chara* is the dominant growth in the lake. It is produced in unlimited quantities so that the food requirements of coots do not seriously compete with those of ducks."

Common names of insects approved for general use by the American Association of Economic Entomologists (*Jour. Econ. Ent., 32 (1939), No. 4, p. 604*).—A list is given of the common names and of the scientific names of 24 insects, approved for general use by the American Association of Economic Entomologists to be added to those previously adopted (E. S. R., 77, p. 507).

Electrical stimulation of isolated heart preparations from Periplaneta americana, J. F. Yeager. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 59 (1939), No. 2, pp. 121–137, figs. 11*).—In the work reported mechanocardiograms from four different types of isolated heart preparations, moistened and perfused with physiological saline, were obtained and the results of faradic stimulation noted. Extrasystoles are caused by stimuli applied during diastasis, diastole, and, apparently, late systole. Summation of contractions occurs, particularly when the stimulus is applied at the height of the contraction curve. No compensatory pauses were observed. The heart of *P. americana* readily gives a tetanic response to a series of stimuli. Apparent staircase phenomena and summation of stimuli were observed. The heart is not absolutely refractory during diastasis, diastole, and, apparently, most of systole; if an absolute refractory period occurs it probably occurs in or about the very early part of systole. The heart can respond to a single mechanical stimulus with a localized, sustained contraction. Contractions of the dorsal body muscles can disturb the mechanocardiogram and can simulate presystolic notches.

[Contributions on entomological technic] (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., 1939, ET–143, pp. 2, pls. 4; ET–144, pp. 2, pls. 2; ET–145, pp. 2, pl. 1;*

ET-146, pp. 2, pls. 3; ET-147, pp. 2, pls. 2; ET-148, pp. 3, pls. 2; ET-149, pp. 2, pl. 1; ET-150, pp. 3, pls. 3; ET-151, pp. 3, pls. 3).—Further contributions (E. S. R., 81, p. 240) are **A Light and Camera Stand for Photographic Copy Work**, by O. A. Hills and R. L. Wallis (ET-143); **Portable Equipment for Applying Insecticidal Concentrates by Atomization**, by S. F. Potts and G. W. Barber (ET-144); **A Power-Driven Mixer for Making Emulsions and Other Sprays in the Field**, by F. P. Dean (ET-145); **A Mobile Insect-Collecting Trap**, by J. R. Douglass and E. H. Bean (ET-146); **A Simple Soil Washer for Large Samples** (ET-147) and **A Sturdy but Compact Soil Sifter for Field Use** (ET-148), both by A. W. Morrill, Jr.; **Laboratory Spraying and Washing Apparatus**, by R. D. Chisholm (ET-149); **Stand and Lighting Accessories for Insect Photography**, by G. A. Runner and G. W. Still (ET-150); and **A Dust Delivery Tube for Laboratory Experiments With Contact Insecticides**, by R. A. Fisher (ET-151).

Use of shoebox emergence cages in the collection of insects inhabiting grasses, D. A. Wilbur and R. Fritz. (Kans. Expt. Sta.). (*Jour. Econ. Ent.*, *32 (1939), No. 4, pp. 571–573, fig. 1*).—A description is given of an efficient and economical method for rearing the insects found in the stems of grasses.

Significant properties of some cryolite materials offered for insecticidal use, R. H. Carter. (U. S. D. A.). (*Jour. Econ. Ent.*, *32 (1939), No. 4, pp. 490–492*).—Analyses of 18 samples of cryolite are reported, the details being given in table form. "Samples of domestic synthetic origin showed an average of 82.8 percent sodium fluoaluminate, samples of foreign synthetic origin 91.3 percent, and samples of natural origin 88.2 percent. Dusting materials showed different sodium fluoaluminate content, depending on the amount of diluent added. Solubility determinations were made on all samples by two methods, (1) chemical analysis and (2) evaporation and weighing of the residues. Results by the two methods were in agreement. The solubilities of the three classes, synthetic domestic, synthetic imported, and natural, were very nearly the same and in close agreement with the solubility figure for cryolite as reported in chemical handbooks. The particle-size distribution of two samples is discussed."

Variation in toxic content of roots of Derris malaccensis var. sarawakensis with increase in age of plants, C. D. V. Georgi and G. L. Teik (*Malayan Agr. Jour.*, *27 (1939), No. 4, pp. 134–140, fig. 1*).—Experimental work covering a period from 19 to 27 mo. has shown that the ether extract of *D. malaccensis sarawakensis* increases gradually to a maximum at 23 mo., after which there is a steady decline as the plants increase in age.

Concentrated mixtures for aerial spraying, S. F. Potts. (U. S. D. A.). (*Jour. Econ. Ent.*, *32 (1939), No. 4, pp. 576–580*).—The application of concentrated spray mixtures resulted in no dripping, and all kinds of foliage were covered equally well. Wet foliage was covered more satisfactorily with concentrates than with conventional spray concentrations. The addition of adhesive oils such as fish oil to concentrated spray mixtures reduced insecticidal injury to tender plants and greatly increased adherence of the mixtures. Methods of preventing drift of insecticides are considered.

The physiological effects of mineral oils on citrus, L. W. Ziegler (*Fla. Ent.*, *22 (1939), No. 2, pp. 21–30*).—The results of two experiments show that applications of high concentrations of mineral oils exert a direct effect on Valencia orange trees, which is most pronounced in the dropping of tree-ripe fruit and mature leaves due to their lowered surface tension allowing for greater penetration of oil. The details are given in four tables. A list of 17 references to the literature is included.

Hydrocyanic acid gas not satisfactory as fumigant for pinworm-area tomatoes, C. R. JONES (*Colo. Farm Bul.* [*Colorado Sta.*], *1* (*1939*), *No. 3, pp. 12, 13*).—Station tests are said to have shown that tomato fruits fumigated with hydrocyanic acid gas usually contain too much cyanogen for human use and that tomatoes in all stages of ripening are susceptible to destructive deposits.

[Work in entomology by the North Carolina Station] (*North Carolina Sta. Rpt. 1938, pp. 34, 35, 39, 50, 51, 52*).—The work of the year (E. S. R., 80, p. 70) briefly referred to relates to the corn earworm, the cabbage maggot, and the pickleworm, and their control, all by B. B. Fulton; and the biology and control of the peanut leafhopper, by Z. P. Metcalf.

[Notes on economic insects and their control] (*Jour. Econ. Ent., 32* (*1939*), *No. 4, pp. 595–598*).—The contributions presented (E. S. R., 81, p. 670) are: The Brown-Banded Cockroach [*Supella supellectilium* (Serville)] in South Dakota, by H. C. Severin (p. 595) (S. Dak. State Col.); The Proper Scientific Name for the Corn Ear Worm [*Heliothis armigera* (Hbn.)], by C. Heinrich (pp. 595, 596) (U. S. D. A.); *Oberea bimaculata* (Oliv.) Injuring Perennial Asters, by H. B. Hungerford (p. 596); Alkaloids in Cubé Root, by H. A. Jones (pp. 596, 597 (U. S. D. A.); Diphenylamine Promising as Soil Poison Against Subterranean Termites, by M. W. Smith (pp. 597, 598) (Ohio State Univ.); and The Removal of Nicotine Spray Residue From Apples, by J. F. Cassidy and E. Smith (p. 598), and The Use of Insecticides in Light Mineral Oil for Corn Ear Worm Control, by G. W. Barber (p. 598) (both U. S. D. A.).

Studies on the effect of crop rotation on some insects infesting corn roots in Illinois, J. H. BIGGER and W. P. FLINT. (Ill. Expt. Sta. et al.). (*Jour. Econ. Ent., 32* (*1939*), *No. 4, pp. 565–571*).—The results of studies conducted on the soils experiment field plats of the station from 1929 to 1938, inclusive, to determine the effect of crop rotation on insects infesting corn roots are reported, the details being given in seven tables. In the rotations there were two conditions generally prevailing, "a clover crop just prior to corn, or grain stubble without clover just prior to corn, with wheat preceding this condition in both cases. The outstanding result of the tests is the fact that recommendations for the use of rotations should be specific as to insect to be controlled. There were times during the development of the project when a change of practice for a single year would have given entirely different results. This could not be done, in fact was not desired, but is the type of thing which the farmer can do and which can be recommended to him on the basis of data made available in this report. It must be stressed that the results shown in these studies refer only to the rotations and practices followed on the fields being used for the experiment."

The wheat field survey for 1939, J. S. HOUSER (*Ohio Sta. Bimo. Bul. 200* (*1939*), *pp. 135–141, figs. 5*).—A continuation of the annual wheat field survey covering the status of the principal pests which damage the crop, infestation by the hessian fly (E. S. R., 80, p. 224), black wheat-stem sawfly (E. S. R., 80, p. 236), and the wheat jointworm in the counties visited being shown by use of maps. The hessian fly infestation increased to 20.5 percent from 10 percent in 1938. The black wheat-stem sawfly was found as far west as Richland, Knox, Licking, and Fairfield Counties. The year was the first for a considerable period that the wheat jointworm has been found present in significant numbers.

Insects infesting stored foods, H. H. SHEPARD (*Minnesota Sta. Bul. 341* (*1939*), *pp. 43, figs. 20*).—This practical account includes descriptions of the principal insects infesting stored foods and means for their control.

The lucerne flea Smynthurus viridis in New Zealand, L. J. DUMBLETON (*New Zeal. Jour. Sci. and Technol., 20* (*1938*), *No. 4A, pp. 197A–211A, figs. 6*).—

A detailed account is given of a study of *S. viridis*, a springtail of European origin. It has been recorded from practically every country in Europe, on the northern coast of Africa, in Argentina, and in all the States of Australia except Queensland, and was first collected in New Zealand in 1929. The nymphal and adult stages of the insect prefer the soft mesophyll tissue of the leaves, and in cases of heavy infestation only the veins of the leaf and the cuticle remain. The flea feeds on a wide variety of low-growing plants of many families, a preference being shown for the broadleaved plants with few veins in the leaves. "Observations are given on the behavior of the insect during the past year in four localities. Serious damage was done at Pokeno to clovers in a hay crop and at Maraekakaho to subterranean clover."

Crop replacement in relation to grasshopper abundance, M. W. SANDERSON. (Ark. Expt. Sta.). (*Jour. Econ. Ent., 32 (1939), No. 4, pp. 484–486*).—It was found that while the differential grasshopper may be destructive to many crops, only certain ones proved particularly suitable food plants. "Cotton did not encourage either rapid growth or reproduction, and an area given almost exclusively to growing cotton would not be favorable to grasshopper abundance. On the other hand the soybean proved a host favorable to both rapid growth and high fecundity of the differential grasshopper. The replacement in Arkansas of large acreages of cotton by soybeans has promoted grasshopper abundance, and if suitable weather prevails may make grasshopper outbreaks possible. With the crop replacement in northeastern Arkansas there has been an increase in pasture acreage. The important pasture plant in this region is Bermuda grass. This grass probably is not responsible for the grasshopper increase in Arkansas, for in experiments the differential grasshopper did not reach the second instar when fed exclusively on this plant."

[***Mormon cricket control in Nevada, 1935–38, 1936–38***], G. G. SCHWEIS, L. M. BURGE, and G. M. SHOGREN (*Nev. State Dept. Agr. Buls. 1–2 (1939), pp. 48, figs. 22*).—The first part of this contribution relates to the Mormon cricket control in 1935–38 (pp. 9–23), previously noted (E. S. R., 76, p. 658), followed by a report of Mormon cricket control work from 1936–38 (pp. 25–41), and an appendix dealing with check pens, airplane dusting experiment, danger to livestock, costs of airplane dusting, new dust materials, 1937, and observations made of sex ratio of the Mormon crickets.

Some ecological notes on the [eastern] lubberly locust (Romalea microptera) Beauv., J. R. WATSON and H. E. BRATLEY. (Fla. Expt. Sta.). (*Fla. Ent., 22 (1939), No. 2, p. 31*).

Grasshoppers and their control, J. R. PARKER (*U. S. Dept. Agr., Farmers' Bul. 1828 (1939), pp. [2]+38, figs. 27*).—This account supersedes Farmers' Bulletin 1691, previously noted (E. S. R., 67, p. 151).

Two new Thysanoptera from Mexico, J. R. WATSON (*Fla. Ent., 22 (1939), No. 2, pp. 17–20, figs. 3*).—*Heterothrips cuernavacae*, collected from an unknown composite at Cuernavaca, Mexico, and *Arpediothrips mexicanus*, taken from beneath the leaf sheaths of a *Yucca* in the State of Neuvo Leon, Mexico, north of Monterey, are described as new.

Biological and control studies on the clover leafhopper, T. C. WATKINS. (Cornell Univ.). (*Jour. Econ. Ent., 32 (1939), No. 4, pp. 561–564*).—A brief summary is given of experiments conducted in western New York during a period of four summers to determine the life history of the clover leafhopper *Aceratagallia sanguinolenta* Prov., vector of the yellow dwarf virus of potato. Nymphs were observed in the field or obtained from adults in caged experiments in the greenhouse on 38 species of plants, a list of which is included. The

results obtained in the dusting and spraying control of this pest are presented in table form.

Permanent program of psyllid control is urged for Colorado potato growers, C. H. METZGER (*Colo. Farm Bul.* [*Colorado Sta.*], *1* (*1939*), *No. 2, pp. 14–16*).—The application of a liquid lime-sulfur spray twice each season or three times in epidemic years is recommended.

Plant lice are best controlled by use of sprays and dusts applied in early spring, M. A. PALMER (*Colo. Farm. Bul.* [*Colorado Sta.*], *1* (*1939*), *No. 2, pp. 13, 14*).—A brief practical account in which nicotine sulfate is recommended as the most reliable insecticide available for use against aphids attacking apple, peach, and cherry trees in early spring.

A preliminary report on the woolly aphids of apple and hawthorn, J. A. COX. (Va. Expt. Sta.). (*Jour. Econ. Ent., 32* (*1939*), *No. 4, pp. 477–483, figs. 7*).—In southwestern Virginia, where hawthorn occurs commonly, transfer experiments were conducted to determine the relation of the woolly aphids on hawthorn and on apple. The young of the spring migrants of the woolly apple aphid established on hawthorn, but less readily than on apple or crab, and the apterous viviparous females collected from hawthorn, apple, and crab established themselves equally well on either host plant. The apterous viviparous females of *Eriosoma crataegi* did not become established on apple or crab but readily established on hawthorn. "*E. crataegi* has never been found on the roots of hawthorn, nor has the feeding of this species on the twigs and branches of hawthorn ever been observed to induce the formation of galls as is the case with *E. lanigerum* . . . . *Aphelinus mali*, a parasite of the woolly apple aphid, was not reared from *E. crataegi* in field collections, nor would it attack this species under cage conditions in the field or in the insectary . . . . The alternate host plant of *E. crataegi* was not found."

Notes on mealy bug injury on strawberry and its resemblance to crinkle, A. A. HILDEBRAND (*Canad. Jour. Res., 17* (*1939*), *No. 7, Sect. C, pp. 205–211, figs. 4*).—Mealybugs (*Pseudococcus* sp. or spp.) are reported to be primarily responsible for the symptoms that for a number of years have been appearing on strawberry plants grown in the greenhouse and in certain respects bear strong resemblance to those of plants affected with the virus disease known as crinkle. The symptoms are quite similar, not only in the appearance of small circular to irregularly shaped translucent spots with more intensely chlorotic central portions on the younger leaves but also in the unevenly chlorotic character and malformation of older leaves and in the ultimate general dwarfing of heavily infested plants.

Control of truck crop aphids, H. G. WALKER and L. D. ANDERSON. (Va. Truck Expt. Sta.). (*Jour. Econ. Ent., 32* (*1939*), *No. 4, pp. 498–505*).—The results of control work with the cabbage aphid, green peach aphid, and pea aphid, conducted at Tidewater, Va., are reported. Good control of the cabbage aphid resulted when young plants were dipped in a nicotine-soap solution containing 1 gal. of nicotine sulfate, 2.5 gal. of Red A Soap, and 500 gal. of water at a temperature of 65° to 70° F. "Poor plants appeared to be slightly injured by this treatment, although healthy plants have been dipped in even stronger solutions without apparent injury. Three percent nicotine dust and vaporized nicotine gave very high kills of the cabbage aphid, although both failed to kill all of the aphids that were protected in close-fitting broccoli heads. Vaporized nicotine and 3 percent nicotine dust were about equally effective in controlling the green peach or spinach aphid on spinach. Dipping cut spinach in a dilute pyrethrum-soap solution was effective in killing the spinach aphid so that the

aphids could be removed in the process of washing before packing the spinach for market. Vaporized nicotine applied while the plants are dry has given the most satisfactory control of the pea aphid under field conditions. Derris and cube sprays in combination with suitable wetting and spreading agents have given good control of the pea aphid in experimental tests, but have failed to give satisfactory results in some field trials by pea growers. Santex R, a product containing a derris extract, has given very promising results as a spray in comparison with sprays containing cube powder. In general, derris and cube have not given as good control of the pea aphid when used as dusts as they have when used as sprays."

Field tests on control of the pea aphid (Illinoia pisi (Kltb.)), C. Graham and E. N. Cory. (Univ. Md.). (*Jour. Econ. Ent., 32 (1939), No. 4, pp. 574–576*).—The use of derris as an insecticide for pea aphid control in large field plats during a period of 3 yr. indicates that when the application is timely and thorough, satisfactory results are obtained. "One yr. of experience with cube in comparison with derris indicates that even though the rotenone content of cube is higher than that of the derris, derris gives better control. Several years of experience on the timing of sprays for pea aphid control show that the best results are obtained when the aphid infestation is not greater than 1 per tip or 10 per sweep when the first application is applied. If the first spray is applied as much as 6 or 8 days before blooming period, another later application is likely to be necessary. One yr. of experiments with rotenone (cube) dusting showed it inferior to rotenone sprays. In general, dusting was less effective than spraying."

Studies on pea aphid control, L. P. Ditman, E. N. Cory, and C. Graham. (Md. Expt. Sta.). (*Jour. Econ. Ent., 32 (1939), No. 4, pp. 537–546, figs. 4*).—The first season's results of a 5-yr. experiment being conducted at the Ridgely Substation on the Eastern Shore of Maryland to determine if annual applications of insecticide for the control of the pea aphid would show a profit are reported, the details being given in seven tables and four graphs. One application of insecticide was not sufficient to secure good control during the severe and extended infestation of the year. "There was little difference in yield of plats receiving a single early application of cube and those receiving a single late application. Neither treatment gave satisfactory control. The number of aphids per sweep, aphids per tip, and percentage tips infested were all satisfactory indices to the degree of control obtained by various spray treatments. Sometimes, however, counts of all aphids on entire plants showed that the above estimates of populations indicated a greater percentage reduction than actually occurred. Severe aphid infestations resulted in a reduction in the average size of shelled peas, which were of poor quality because of increased hardness, as well as in reduction of yields."

Temperature in the life history of Rhopalosiphum subterraneum Mason, a new cotton root aphid, C. F. Rainwater and N. Allen. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 4, pp. 557–560, figs. 3*).—A statistical analysis of the relationship of temperature to the rate of reproduction, the length of adult life, and the developmental period of *R. subterraneum* indicated "a significant positive linear relationship between the average mean temperature and the rate of reproduction, and a significant negative linear relationship between the average mean temperature and the average length of adult life. The relationship of temperature to the development was found to be curvilinear, and a second degree parabola was found to express this relationship best."

Plowing dates as they affected the abundance of corn root aphids at Clayton, Illinois, 1929–1932, J. H. Bigger and F. C. Bauer. (Ill. Expt. Sta.

et al.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 8, pp. 695–697*).—The results obtained in control work with the corn root aphid under two different cultural practices, conducted during a period of 4 yr. on the soils experiment field of the Illinois Experiment Station at Clayton in western Illinois on well-drained brown silt soil, are reported. It was shown that the practice of plowing in the first half of April and not working the ground until just prior to corn planting resulted in a heavier infestation than the practice of plowing a week prior to corn planting and thorough working of the soil in the meantime. These results were consistent for the 4-yr. period when the records were obtainable. The authors are led to recommend that plowing of the field be delayed until just prior to corn planting where corn root aphid control is the only factor to be considered.

Timing seasonal occurrence and abundance of the codling moth, D. Isely (*Arkansas Sta. Bul. 382 (1939), pp. 26, figs. 6*).—The results of a study of the seasonal history of the codling moth, commenced in the summer of 1936 and continued throughout 1937 and 1938 at Fayetteville in the apple-producing area of northwestern Arkansas, are reported in eight tables and six figures. The author finds that "the most favorable mean temperature for high daily oviposition appears to be 27° C. (80.6° F.). Temperature higher or lower than this tends to reduce the daily oviposition. Mean temperatures of 30° C. or above reduce the daily average number of eggs deposited by moths that continue reproducing and abruptly terminate the oviposition period of others. Excessive temperatures may also produce sterility of the eggs deposited. Low temperatures retard the daily oviposition but prolong the life of the moths, and for this reason the temperature most favorable for greatest oviposition during the entire life of a moth is lower than the temperature most favorable for rapid reproduction. A mean of 25° throughout the entire life of moths is the temperature at which the greatest total oviposition in cages occurs. The length of life of moths is prolonged as the mean temperature falls from 33° to 15°. While the reproductive period of moths may be prolonged in cages, any postponement of reproduction in the field is a disadvantage to the species, since it increases the chance of the moths being destroyed by rain or other means before their reproduction is completed. During midsummer 90 percent of the eggs are deposited during the first 7 days. During spring the same percentage is deposited in 12 days.

"During the early part of summer practically all full-grown larvae change to pupae in their cocoons and in 9 to 12 days after pupation transform as adult moths. These moths deposit eggs and produce the later generations. As the season advances an increasing proportion of larvae fail to transform but enter hibernation. This change is slow at first but at some time during August the majority of larvae enter hibernation and do not pupate. . . . A small percentage of larvae transform to the pupal stage in September and emerge as moths late in the month. In orchards of early varieties of apples all larvae that pass winter must of necessity enter hibernation early. The average time of emergence of moths the succeeding spring from larvae that enter hibernation before September 1 is 3 to 4 days earlier than that of those which enter hibernation after September 1."

Derris as a toxic supplement to oil emulsions for the control of purple scale, L. L. English. (Ala. Expt. Sta.). (*Jour. Econ. Ent., 32 (1939), No. 4, pp. 587–595, figs. 9*).—A report is made of experiments with potted plants and in the field for the control of purple scale on Satsuma oranges. "Emulsions prepared from several oils and emulsifying agents were used as carriers for derris. No control attributable to derris was obtained with an 83 viscosity

*tank-mix oil spray as the carrier. However, derris was effective when used with a 41 viscosity tank-mix oil spray and with diglycol laurate. In experiences with potted plants derris was an effective supplement to Mineral Seal Oil emulsions prepared with diglycol laurate, diglycol oleate, sodium oleyl sulfate, powdered skim milk, or with dried blood albumin in a tank-mix spray. Although the tank-mix emulsion with derris was the most effective spray applied to potted plants, the increase in effectiveness attributable to derris was low and positive field results were not obtained. Greater increases in kill attributable to derris were obtained with emulsions prepared from diglycol laurate, diglycol oleate, and sodium oleyl sulfate. Both derris and Derrisol reduced significantly the percentage of scaly fruit on field plats when used as supplements to a 2 percent emulsion prepared from Mineral Seal Oil and diglycol oleate. An experiment with extracted and unextracted derris showed that derris was a true toxicant to purple scale."

Taxonomy of some scale insects of the genus Parlatoria encountered in plant quarantine inspection work, H. MORRISON (*U. S. Dept. Agr., Misc. Pub. 344 (1939), pp. 34, pls. 11*).—The structural characters of scale insects of the genus *Parlatoria*, species of which are recorded as serious pests of citrus groves in various parts of the world and others as injurious to various horticulturally important rosaceous hosts, such as the apple, pear, and peach, together with their hosts and distribution, are first considered, followed by descriptions of 12 species of the genus. A list of the 12 species and their synonyms, a key to the species, and a list of 56 references to the literature cited are included.

Toxicity of certain organic insecticides to codling moth larvae in laboratory tests, E. H. SIEGLER, F. MUNGER, and L. E. SMITH (*U. S. Dept. Agr. Cir. 523 (1939), pp. 10*).—Report is made of laboratory tests of the toxicity of organic compounds for the larva of the codling moth, by the apple-plug method, conducted in continuation of earlier studies (E. S. R., 72, p. 508). A large number of synthetic organic compounds were used in the experiments, of which those that gave 50 percent or less of infested apple plugs with respect to initial toxicity were as follows: Thiocarbanilide, acetone semicarbazone, *p*-nitrosodimethylaniline, dibenzothiophene, thioxanthydrol, thioxanthone, phenothioxin, 2-thiocoumarin, diphenyl disulfide, 4,6-dinitro-*o*-cresol acetate, *p*-bromobiphenyl, 2-phenylbenzoxazole, 1-nitroso-2-naphthol, 3,5-dinitro-*o*-cresol, 2-methyl-4-6-dinitroanisole, pentachlorophenol, and 3,4-benzocinnoline.

Desilking sweet corn to control corn ear worms, and notes on control of fall armyworms, H. G. WALKER and L. D. ANDERSON. (Va. Truck Expt. Sta.). (*Jour. Econ. Ent., 32 (1939), No. 4, pp. 492–495, fig. 1*).—The results of desilking four varieties of sweet corn planted at Norfolk, Va., on three different dates in the spring of 1938 are reported, the details being given in tables. It is shown that desilking sweet corn will reduce the amount of corn earworm injury "when this insect is a serious pest. As measured by these tests, it would seem rather doubtful if the benefits received from desilking would pay for the cost of treatment on a large commercial scale. However, it is believed that where labor is cheap, or in small home gardens where labor is not a factor, and especially on varieties of sweet corn that are susceptible to corn earworm injury, desilking might be profitably resorted to as a means of at least partially controlling this pest. Desilking at 5-day intervals was almost as effective as at 3-day intervals in these tests."

Experiments with quebracho-fixed nicotine for the control of the European corn borer, C. H. BATCHELDER. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 4, pp. 513–516, fig. 1*).—The results of field-plat experiments with quebracho-fixed nicotine have indicated that this material merits further con-

sideration as an insecticide for the control of the European corn borer. "When applied to sweet corn its insecticidal properties were found to be comparable with those of powdered derris root. The substance with which nicotine is combined, quebracho extract, confers upon the material unique physical properties desirable in an insecticide. These include the capacity for preparation of fixed nicotine in stable concentrated form for storage, the presence of a self-contained wetting and spreading agent, and convenience in handling when sprays are mixed for field use."

Host plants and seasonal development of the European corn borer in New Jersey, C. A. CLARK. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 4, pp. 516–520, fig. 1*).—Investigations in New Jersey have shown corn to be the preferred host plant of the European corn borer. "Early sweet corn in Burlington County was only lightly infested by the first-generation borer in 1938, but both field and sweet corn throughout the central part of the State carried high populations of the second generation of the insect, with severe economic damage in many fields. Potatoes were heavily infested by first-generation borers, especially where corn acreages had been reduced or eliminated. Second-generation borers were found in dahlias, gladiolus, asters, ragweed, smartweed, and string beans. A partial third generation of the corn borer attacked, in addition to late corn, late-planted potatoes that were grown for seed. In central New Jersey in 1938 the presence of the first generation (egg to adult, inclusive) extended from about June 1 to about July 15. The second generation was present after July 15, and a small percentage of this generation passed into a third generation starting late in August. The occurrence of a partial third generation in New Jersey in 1938 was corroborated in plat and cage work."

Studies on the flight of European corn borer moths to light traps: A progress report, G. A. FICHT and T. E. HIENTON. (Ind. Expt. Sta.). (*Jour. Econ. Ent., 32 (1939), No. 4, pp. 520–526, figs. 2*).—Preliminary studies with different types of lamps have shown that European corn borer moths are definitely attracted to lamps used in sufficient numbers to reduce, though not to eliminate, the borer populations of the lighted areas. "While the concentration of light was higher than it would be practical to use for the control of the borer in a single crop during both broods, different lamps with higher intrinsic brilliance and lower power requirements, along with a possible reduction in the number of lamps used to reduce the cost of installation and operation, would seem to justify further experimental work. Further reduction in these costs might possibly be obtained by shortening the hours of active operation and, in the case of sweet corn, by using the light traps only during one flight of moths for the control of either the first- or second-brood flights. The large number of gravid female moths taken during the past year of study would offer some hope of limiting infestations within, or in the vicinity of, lighted areas."

Investigations of insecticides for control of the European corn borer at Toledo, Ohio, 1937–1938, W. A. BAKER and D. D. QUESTEL. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 4, pp. 526–530*).—Report is made of the results of investigations of insecticides to control the European corn borer conducted under field-plat conditions during the season 1937–38 near Toledo, Ohio. The studies relate to the effectiveness of fixed nicotine preparations, fluorine compounds, phenothiazine, and derris, applied in either spray or dust form. "In general the performance of the sprays was more effective than that of the dust preparations. Derris and the fluorine compounds provided a high degree of protection when used as sprays in a standard treatment schedule of four applications at 5-day intervals, starting immediately after the first hatching of corn

borer eggs. The fluorine compounds caused more or less injury to the plants, however, which makes their use undesirable unless some means can be devised to eliminate their burning effects. No reduction in the toxicity of sodium fluoaluminate to the borer was noticeable when the concentration of this material was reduced to as low as 0.5 lb. per 100 gal. of water. This reduction in concentration, however, did not reduce the injurious effects on the plant. Dust applications may be modified to accomodate rainfall distribution and plant growth by changing the standard treatment schedule to permit of applications immediately following a rain, or increasing the number of applications, or both. It is believed that this adjustment would increase materially the effectiveness of dusts, with consequent lowering of costs because of the ease and rapidity with which dust applications may be made."

Sweet corn resistance to larval survival of the European corn borer, M. SCHLOSBERG and W. A. BAKER. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 4, pp. 530–534, fig. 1*).—In studies of the relation of plant development to resistance of sweet corn, two inbred strains known as M1828 and C2 were compared. The authors are led to conclude that "significant differences in larval survival occurred between the strains through a tested range in stage of plant development when the infestation occurred from approximately 25 days to 5 days prior to silk appearance, beyond which stage comparable data were not available. The lack of significant differentiation in larval survival between the strains when infested at earlier stages of plant development is economically unimportant. Available information shows that, irrespective of egg load, infestation at early stages of plant development results in low larval populations that have little economic significance. Since in previous tests, when compared to a large number of inbred sweet corn strains similarly tested, C2 was shown to be of approximately average performance and M1828 lower than average with respect to the survival of larval progeny, the data presented afford the conclusion that the lower larval populations obtained in M1828 demonstrated the presence in this strain of influences inhibitive to the survival of the borer over a wide range in the growth period of the strain."

Grasses of the tribe Hordeae as hosts of the hessian fly, E. T. JONES. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 4, pp. 505–510, figs. 2*).—Experimental work conducted in search for new host plants of the hessian fly has shown that the pest completes its life cycle on many species of grasses belonging to the tribe Hordeae. It did not become established on grasses of other genera, except on three species of the genus *Bromus*, on which a few small distorted puparia were produced. "Field collections of hessian fly puparia from several wild grasses of the tribe Hordeae indicate *Elymus virginicus*, *E. canadensis*, *Agropyron smithii*, and *Hordeum pusillum* to be hosts satisfactory to the fly. When exposed to infestation in cages, *A. pungens*, *Haynaldia villosa*, and six species of *Lolium* were found resistant to infestation, whereas *Hystrix californica*, *Sitanion hystrix*, *Triticum aegilopoides boeoticum*, 15 species of *Agropyron*, and 14 species of *Elymus* were found susceptible. Different strains of these wheatlike grasses varied greatly in resistance to infestation. Susceptibility to infestation appeared in many cases to be correlated with the character of the tissue of the leaf sheaths. In general, plants with soft tissues produced the largest numbers of puparia."

Status and relative importance of the parasites of the hessian fly in the Atlantic States, C. C. HILL, J. S. PINCKNEY, and E. J. UDINE (*U. S. Dept. Agr., Tech. Bul. 689 (1939), pp. 15*).—This is a report of parasite work with the hessian fly, of which earlier studies have been noted (E. S. R., 60, p. 61). The investigations have shown the spring generation of the hessian fly to undergo an

average annual parasitization of about 62 percent in the wheat-growing districts of western New York, 63 percent in those of Pennsylvania, Maryland, and part of Virginia, and 47 percent in southern Virginia and North Carolina. These figures represent about two-thirds of the total mortality of the spring generation in these areas. Lower mortality in the southern area is partly attributed to the lesser abundance of the parasite *Eupelmus allynii* and the practical absence of *Platygaster zosine*. In all, 18 species of hymenopterous parasites were found attacking the hessian fly in these areas. By far the most important of these were *P. hiemalis*, *P. zosine*, and *E. allynii*. Other useful ones were *P. herrickii*, *Merisus destructor*, *M. febriculosus*, *Tetrastichus carinatus*, *Pleurotropis metallicus*, and *Eupelmella vesicularis*. The remaining species were of insignificant value. *Platygaster hiemalis* is of special value because it is the principal parasite that attacks the fall generation of the hessian fly, and because of its wide distribution. The average annual parasitization by this species amounted to 43 percent in New York, 22 percent in Pennsylvania, Maryland, and Virginia, and 8 percent in North Carolina. It was found to parasitize to a slight extent the spring generation of the hessian fly in the St. Lawrence plain in Jefferson County, N. Y.

The pest mosquito problem in the Minneapolis-St. Paul metropolitan area, W. A. Riley and W. Chalgren. (Minn. Expt. Sta.). (*Jour. Econ. Ent.*, *32* (*1939*), *No. 4*, *pp. 553–557*).—In trap collections of mosquitoes extending over a period from June 21 to October 15, 1937, 34,553 adults, representing 27 species, were taken and identified. "*Aedes vexans* (Meig.) led the list, with a catch of 30,885, or 89.47 percent of the entire catch. Only 4 other species were taken in numbers exceeding 1 percent of the total. These were, in order, *Culex tarsalis* Coq. with 2.51 percent, *Uranotaenia sapphirina* (Osten.) 1.88 percent, *C. territans* Walk. 1.51 percent, and *A. cinereus* Meig. 1.08 percent. *U. sapphirina* is a species which, regardless of numbers, rarely feeds on man. Three out of a thousand of the total catch were *Anopheles maculipennis* Meig., and about the same proportion of *A. walkeri* Theob. was present. The last 12 species on the list totaled only 0.48 percent of the catch." During the season of 1938, 337,960 adults were caught and determined. "Of these, 332,176, or 98.28 percent, were the marsh-breeding migratory *Aedes vexans*. *C. tarsalis* again held second place but with a percentage which had dropped to 0.46. The next 3 places were held by *A. dorsalis* Meig., *A. cinereus*, and *C. apicalis* Adams. Of the anophelines, *Anopheles walkeri* was represented by 221 specimens, or 0.065 percent of the total, *A. maculipennis* by 65, or 0.02, while only 10 specimens of *A. punctipennis* (Say) were taken."

Larvicides and contact sprays used in mosquito control, E. I. McDaniel (*Michigan Sta. Quart. Bul.*, *22* (*1939*), *No. 1*, *pp. 32–34*).—A brief practical discussion of mosquito control by use of larvicides and contact sprays.

Problems concerning the efficiency of oils as mosquito larvicides.—II, The spreading power of oils and methods of increasing it, D. R. P. Murray (*Bul. Ent. Res.*, *30* (*1939*), *No. 2*, *pp. 211–236*).—In continuation of this report (E. S. R., 80, p. 232), an account is given of a method of using the so-called Adam-Langmuir surface pressure trough for the direct measurement of the spreading power of oils against surface contamination. "Pure higher paraffins are nonspreading, and pure aromatics have only a small spreading pressure. Commercial grades of oils owe what spreading pressure they have to impurities which are only present in small quantities and can be removed. The spreading power of oil is greatly increased by irradiation of very thin layers of the oil. Even so, only a small fraction undergoes chemical change, the great bulk being recoverable with its original properties. Straight chain fatty acids and alcohols

only raise the spreading pressure of clean oil to a figure which is often already reached in a cruder product. There is some evidence, however, that a simple group such as -OH can produce a high pressure if attached to the right hydrocarbon framework. Of the substances investigated the ones producing the greatest effect were the products of combined polymerization and oxidation of olefinic hydrocarbons (cracked spirit gum) and the products of sulfonation of oils. Substances soluble in water do not form good spread aiders because they dissolve out of the oil, which then contracts again if there is resistance to its spread. The maximum spreading pressure exerted by a substance in oil solution is greater in paraffin than in aromatic oils. When oil is shaken with a solvent which separates aromatics from paraffins, the spreading constituents, whether naturally occurring or added, pass into the aromatic fraction. Strong concentrates can be obtained in this way, and methods can be easily devised for transferring the active materials from one oil to another. The spreading constituents can be entirely removed from oil by filtering it through fuller's earth."

The utilization of low temperatures in the sterilization of deciduous fruit infested with the Mediterranean fruit fly (*Ceratitis capitata* Wied.), R. G. Nel (*Union So. Africa Dept. Agr. and Forestry, Sci. Bul. 155 (1936), pp. 33, figs. 4*).—The immature stages of the Mediterranean fruitfly were found to be destroyed by constant exposures of 9 days at 31° F., 12 days at 34°, and 16 days at 37°. The same result was obtained by subjecting infested fruit to the following varying low temperatures: 2 days at 31° and 17 days at 34°, 4 days at 31° and 6 days at 37°, and 4 days at 34° and 12 days at 37°. No stage of the Mediterranean fruitfly was found to survive three experimental shipments of fly-infested grapes from Capetown, made under commercial conditions, to England, March-April 1935. It is concluded that the temperatures employed in the existing methods of commercial precooling and refrigerated transport can readily be used to disinfest fruit, thereby dispensing with the necessity of additional precautionary measures at the ports of those countries which have quarantine regulations in operation against fruit from Mediterranean fruitfly regions.

Ten years of warfare against the blueberry maggot, F. H. Lathrop. (Maine Expt. Sta.). (*Jour. Econ. Ent., 32 (1939), No. 4, pp. 510–513, figs. 2*).—A summary is given of the results of control work with the blueberry maggot conducted in Washington County over a period of 10 yr., the details being presented in table and graph form. Earlier work by the author and C. B. Nickels has been noted (E. S. R., 64, p. 58).

The European frit fly and its forms in North America, C. W. Sabrosky. (Mich. Expt. Sta.). (*Ann. Ent. Soc. Amer., 32 (1939), No. 2, pp. 321–324*).—The author's studies have led to the proposal of a new classification for the frit fly, an important pest of grains in Europe, and its relatives. Three species and one variety, namely, *Oscinella frit* (L.), *O. frit* var. *nitidissima* Mgn., *O. soror* (Macq.), and *O. carbonaria* (Lw.), are recognized as distinct forms. It is pointed out that the frit fly and its relatives have not attained the same importance as pests of grain in North America as in the Palaearctic region.

The holly leaf-miner (Phytomyza ilicis Curt.) and its parasites, E. Cameron (*Bul. Ent. Res., 30 (1939), No. 2, pp. 173–208, figs. 15*).—A brief general account is first given of the systematics and biology of the holly leaf miner, the most serious pest of holly on the western coast of British Columbia, where it was introduced from Europe without its natural enemies. In compliance with a request made by the Dominion of Canada Government for the European parasites of this miner, the Imperial Institute of Entomology made a comprehensive study and here reports upon the various species of Hymenoptera that

attack the immature stages of the leaf miner in England. The parasites reared by the author and recorded from this host for the first time are: *Chrysocharis gemma* (Curt.) Walk., *C. syma* Walk., *Pleurotropis amyntas* Walk., *Sphegigaster flavicornis* Walk., *Cyrtogaster vulgaris* Walk., *Opius ilicis* Nixon, and several rare forms. Of these, *C. gemma* was by far the most common species. "All of them, with the exception of *C. gemma*, which completes its life history in the larva, are parasites of the pupa, and all except *P. amyntas* are primary in habit. The latter acts in the dual capacity of a primary on the fly pupa and a secondary on the larva and pupa of *S. flavicornis* and other primary parasites." Keys to the adult parasites, larvae, and pupae are included, also a list of 30 references to the literature.

A summary of family nomenclature in the order Diptera, C. W. SABROSKY. (Mich. Expt. Sta.). (*7. Internatl. Kong. Ent., Berlin, 1938, I, Verhandl., pp. 599–612*).—In this contribution the family names and basic nomenclature of the order Diptera are reviewed and criticized. A tabulated comparison is made of the family nomenclature as used by Comstock (1930), Curran (1934), Brues and Melander (1932), and Linder (1930–37).

Winter quarters of the spotted cucumber beetle and the cowpea curculio, and results of burning, T. L. BISSELL. (Ga. Expt. Sta.). (*Jour. Econ. Ent., 32 (1939), No. 4, pp. 546–553, figs. 3*).—During 4 winters samples taken from 20 kinds of vegetation covering approximately 500 sq. yd. were examined for hibernating stages of the spotted cucumber beetle and the cowpea curculio. "The samples were taken from cultivated crops and from field borders, [and] from legumes, grasses, trees, and vines. Cowpeas, Bermuda grass, forest, and broomsedge furnished two-thirds of the samples. Practically all were from the soil surface. The number of insects per square yard is calculated for each plant material. Broomsedge (*Andropogon virginicus* L.) held the highest concentrations of each insect, but eight other materials were used by the cucumber beetle and seven others by the cowpea curculio. The number of curculios per square yard in cowpeas was relatively low, but it is concluded that in the aggregate a large part of the curculios winter over among dead cowpea plants. Cowpea curculios in winter quarters in broomsedge and other materials other than cowpeas were found concentrated near cowpeas, the number per unit sample decreasing sharply with the distance from the cowpea fields. The curculios enter winter quarters about October 15 and begin to leave the latter part of April or first of May—the emergence period in 1938 extending into July. . . . In a test of burning broomsedge to control insects, cucumber beetles seemed to be readily killed but only 23 percent of the curculios succumbed."

Cucumber beetle control studies in 1937 and 1938, G. E. GOULD. (Ind. Expt. Sta.). (*Jour. Econ. Ent., 32 (1939), No. 4, pp. 534–537*).—Striped cucumber beetle control tests conducted during the years 1937 and 1938 in continuation of those of 1935 (E. S. R., 76, p. 77), the details of which are given in table form, indicate that the calcium arsenate-insoluble copper-talc mixture is significantly better "than the standard 1–9 calcium arsenate-gypsum mixture. In addition a cryolite talc mixture without fungicide has shown excellent results. In all mixtures containing copper, except in the case of copper arsenate, the number of plants dying from wilt decreased, even though the spray mixtures caused some stunting of the plants."

Notes on the tobacco flea beetle (Epitrix parvula (F.)), C. B. DOMINICK. (Va. Expt. Sta.). (*Jour. Econ. Ent., 32 (1939), No. 4, pp. 495–498, figs. 2*).—The results of studies of the hibernation and seasonal life history of the tobacco flea beetle commenced at Chatham, Va., in June 1937, following a season in which tobacco growers suffered heavy losses, are reported. A diagrammatic

representation of its seasonal life history is presented. The beetles were found to commence emerging from hibernation in 1938 on March 19 and continued until May 28. "They were found in hibernation in the fall on September 21, although a few were found feeding sparingly on tobacco as late as November 1. Four generations were reared in the insectary. The lengths of the stages are summarized in this paper."

The results of shipments of the predatory elaterid beetle Pyrophorus luminosus from Puerto Rico to England, K. A. Bartlett. (P. R. Expt. Sta.) (*Bul. Ent. Res., 30 (1939), No. 2, pp. 209, 210*).—A report upon the introduction of larvae of the predatory elaterid *P. luminosus* from Puerto Rico, where it is indigenous, into Mauritius to combat the destructive white grub *Phytalus smithi* Arrow. The 72.04 percent survival of all shipments and 87.02 percent for the final shipment of 1,896 larvae made in 1937 from Puerto Rico to England are reported.

The Black Hills beetle, a serious enemy of Rocky Mountain pines, J. A. Beal (*U. S. Dept. Agr., Farmers' Bul. 1824 (1939), pp. [2]+22, figs. 18*).—A practical account of the Black Hills beetle and its work, its seasonal history and habits, and the methods that have been employed to prevent and suppress outbreaks. The periodic widespread epidemics of this pest are said by the author to have been responsible for the destruction of more merchantable pine timber in the Rocky Mountain region than has any other agency. The tiny beetle kills healthy, vigorous pines of practically all ages and of all species that occur within its range. It kills trees by attacking the trunks and thus introducing blue-staining fungi which cut off water conduction to the leaves, and by destroying the soft inner bark through which they get their nourishment. When everything is favorable for the developing broods of this insect it increases rapidly from endemic to epidemic status and, unless unfavorable climatic conditions quickly reduce the outbreak, artificial control becomes necessary.

Elm bark beetles, T. H. Jones (*U. S. Dept. Agr. Leaflet 185 (1939), pp. 8, figs. 7*).—A practical account of the two species of bark beetles that commonly attack elm in the United States and are associated with the spread of the Dutch elm disease fungus, namely, the smaller European elm bark beetle and the native elm bark beetle.

Studies in population physiology.—IX, The effect of imago population density on the duration of the larval and pupal stages of Tribolium confusum Duval, T. Park, E. V. Miller, and C. Z. Lutherman (*Ecology, 20 (1939), No. 3, pp. 365–373, fig. 1*).—A continuation of these studies (E. S. R., 81, p. 258).

Dichloroethyl ether for the control of the plum curculio attacking peaches, O. I. Snapp. (U. S. D. A.) (*Jour. Econ. Ent., 32 (1939), No. 4, pp. 486–490, figs. 2*).—In laboratory experiments at Fort Valley, Ga., not a single individual reached the adult stage when dichloroethyl ether was used against plum curculio pupae at strengths of ⅔ and 1 fluid oz. per gallon of water on each square yard of soil. "In tests conducted in soil under caged trees in the orchard, the use of 1 gal. of water containing 1 fluid oz. of dichloroethyl ether on each square yard of soil caused complete mortality of the insect in the pupal stage. Used against the larvae at a strength of ⅛ fluid oz. per gallon, applied at the rate of 1 gal. per square yard, it permitted the survival and emergence of 0.9 percent of the insects. These, however, caused no damage to the fruit." The results indicate that this material is worthy of further investigation as a possible substitute for lead arsenate in the control of the plum curculio attacking peaches. A desirable feature is that it is applied to the soil instead of to the foliage and fruit.

Bactericidal properties of royal jelly of the honeybee, C. S. McCleskey and R. M. Melampy. (La. State Univ. and U. S. D. A.) (*Jour. Econ. Ent., 32 (1939), No. 4, pp. 581–587*).—The bacteriostatic action of royal jelly was found to be greater against "the Gram-positive *Staphylococcus aureus* and *Bacillus metiens* than against the Gram-negative *Escherichia coli* and *Eberthella typhosa*, whereas the bactericidal action was more pronounced with the Gram-negative organism. The germicidal activity at 20° C. is markedly reduced when the pH is shifted from 4.5 to 6.0 and is practically destroyed at pH 8.0. Temperature was found to have a marked influence on germicidal activity. Sterilization of test cultures required less than 5 min. at 43° and 10 to 30 min. at 22°–25°, whereas at 5° sterilization was not accomplished in 48 hr. The active principle in royal jelly was not filtrable through paper, and was found in the sediment on centrifugation. Autoclaving at 120° for 20 min. did not destroy the germicidal principle. The active principle was removed from royal jelly by extraction with alcohol and with acetone. From these extracts crystals were obtained which appear to possess the germicidal principle."

The cellar wintering of bees, C. H. Gilbert (*Wyoming Sta. Bul. 234 (1939), pp. 20, figs. 5*).—Experiments on the cellar wintering of bees in Wyoming, where they are subjected to winter conditions for at least 7 mo. of each year, are reported, and a comparison is made of this method with others tested at the same time. The details of a comparison of two bee cellars and tar paper packing and sawdust packing over a period of eight winters, from 1930–31 to 1937–38, and the relative humidity in the two bee cellars compared to outside conditions are reported in table form. The tar paper packing consisted of two thicknesses of building paper covered with tar paper. Six in. of sawdust provided insulation for the sawdust packing cases. Each year colonies packed in tar paper and in sawdust packing cases wintered better than those in the cellars, as shown by lower winter losses, low consumption of stores, condition of surviving colonies, and increased honey production. The rating of the wintering methods tested, based on honey production, is as follows: (1) Tar paper packing, (2) sawdust packing, (3) cold cellar, and (4) natural cellar.

Natural control of Diprion similis Htg. in Poland during 1936, J. E. Hardy (*Bul. Ent. Res., 30 (1939), No. 2, pp. 237–246, figs. 2*).—Large infestations of *Diprion* species have been studied in England with a view to biological control of the European spruce sawfly in Canada. In the course of the work a heavy infestation of the introduced pine sawfly (*D. simile*) was located in Poland near Wloslawek. "By field observations and dissections it was discovered that predators had killed 46 percent of the sawfly population during the winter. Their attacks were not continued during the summer months. Pathogenic organisms proved to be a most efficacious factor of control, for the disease mortality of sawflies surviving the attacks of predators rose from 37.4 percent in April 1936 to 86 percent in the following December. Parasitism of the survivors of both predators and pathogenic organisms rose to its highest peak in October, when 54.9 percent was recorded. At the commencement of warmer weather the population of chalcid parasites increased rapidly but suddenly fell to negligible proportions after June, while that of the ichneumonids continued to rise steadily. It is suggested that the great heat experienced in the early summer months resulted in the death of the chalcids."

On the period of survival of the egg, larva, and first nymph stages of the argasid tick Ornithodorus moubata Murray at different relative humidities, G. A. Brett (*Bul. Ent. Res., 30 (1939), No. 2, pp. 247–253*).—An investigation of the longevity and development of the eggs of *O. moubata* at different humidities between 6.2 percent and 80 percent led to the finding that all stages

investigated, which included the egg, larva, and first nymph, survived for a much longer period at high humidities than at low. The longevity showed a steady gradation through the range of humidities used. Even at very low humidities a sufficient proportion of eggs developed to the first nymph stage to carry on the race. The first nymph is much more resistant to desiccation than the earlier stages.

ANIMAL PRODUCTION

[**Abstracts of papers on animal nutrition presented at the 33rd annual meeting of the American Society of Biological Chemists**] (*Jour. Biol. Chem., 128 (1939), No. 3, pp. xxxi, xxxii, xlvi, xlvii, lv, lxxi–lxxiii, lxxv, lxxvi, lxxvii, lxxviii, lxxxvii*).—Abstracts of the following papers pertaining to animal nutrition are noted: The Rôle of Iron, Copper, and Cobalt in Hemoglobin Production in Dogs on a Milk Diet, by D. V. Frost and C. A. Elvehjem (Univ. Wis.); Anemia in Chicks Due to Vitamin Deficiency, by A. G. Hogan and E. M. Parrott (Univ. Mo.); The Grass Juice Factor, by G. O. Kohler, S. B. Randle, and J. R. Wagner (Univ. Wis.); Comparison of Several Calcium Salts as to Their Effect Upon Lactose Utilization, by H. S. Mitchell, G. M. Cook, and K. L. O'Brien (Mass. State Col.); Hypervitaminoses D_2 and D_3 in Rats as Affected by Calcium and Phosphorus of the Diet, by A. F. Morgan, J. B. Hendricks, and N. Shimotori (Univ. Calif.); The Effect of Phosphorus on the Biological Estimation of Vitamin D Activity, by B. O'Brien and K. Morgareidge; The Influence of Melting Points of Fats on Their Utilization by Herbivora, by H. Paul and C. M. McCay (Cornell Univ.); and Low Phosphorus Diets and Urinary Lithiasis, by H. Schneider (Univ. Wis.).

[**Animal production and poultry studies in the Southern States**] (*Assoc. South. Agr. Workers Proc., 40 (1939), pp. 69–80, 83–85, 87, 88, 162, 163, 164, 165–167*).—Abstracts of the following papers presented at New Orleans, La., February 1–3, 1939, are included: Relation of Nutrition to Southern Livestock Production, by G. S. Fraps (Tex. Expt. Sta.); Livestock in Relation to Human Nutrition, by W. D. Salmon (Ala. Sta.); Mineral Research in Animal Nutrition, by V. R. Berliner, E. W. Sheets, and J. S. Moore (Miss. Sta.); Mechanical Refrigeration and Freezer Storage for Meat, by K. F. Warner and J. Snow (U. S. D. A. and Univ. Tenn.); Studies of Some Factors Involved in Farm Pork Curing, by W. E. Sewell (Ala. Polytech. Inst.); Farm Meat Supply in Summer, by J. B. Francioni (Univ. La.); Farm Meat Supply in Winter, by A. L. Shealy (Univ. Fla.); Nutritional Deficiencies in Southern Livestock Production, by R. H. Lush (La. Sta.); The Improvement and Use of Southern Feed Crops—Peanuts, by W. G. Kirk (Fla. Sta.); Pastures—Bluegrass Region, by E. S. Good (Univ. Ky.); Silage Crops, by C. I. Bray (La. Sta.); The Improvement and Use of Southern Feed Crops, by P. F. Newell (Miss. State Col.); Does the South Need More Livestock? by L. A. Richardson (Univ. Tenn.); Range Utilization and Improvement, by A. L. Smith (Tex. A. and M. Col.); Problems of Finishing Meat Animals in the South, by P. E. Howe and O. G. Hankins (U. S. D. A.); The Production of Market Ducklings Under Gulf Coast Conditions, by C. E. Ryan, H. J. Davis, and C. W. Upp (La. State Univ.); Breeding Poultry for Improvement in Livability or Viability, by C. W. Upp (La. Sta.); A Study of Fowl Leukosis—The Effect of Adding Wheat Germ Oil to the Ration, by G. W. Anderson, R. C. Ringrose, and C. L. Morgan (S. C. Sta.); Some Observations Concerning Sulfur in the Diet of Chicks—A Preliminary Report, by O. E. Goff and C. W. Upp (La. Sta.); and Methods of Developing the National Poultry Improvement Plan in the Southern States to Its Most Efficient Use, by P. B. Zumbro (U. S. D. A.).

[Livestock investigations in North Carolina], E. H. Hostetler, J. E. Foster, J. O. Halverson, F. W. Sherwood, R. E. Stitt, R. S. Dearstyne, H. Smith, and C. O. Bollinger. (Partly coop. U. S. D. A.). (*North Carolina Sta. Rpt. 1938, pp. 41–43, 54–56, 63–65, 66, 72–77*).—Included are progress reports (E. S. R., 80, p. 86) for the following studies: The value of native reeds (*Arundinaria tecta*) for grazing cattle; the comparative gains of cattle on reed v. tame pasture; the value of crop gleanings for wintering beef cattle; the rate and economy of gains of beef steers on lespedeza hay alone v. lespedeza hay and shelled corn; the fattening qualities of first-cross v. second-cross Hereford yearling steers; a comparison of soybean hay, alfalfa hay, and yellow corn as sources of vitamin A for growing cattle fed cottonseed meal rations; a comparison of different methods of feeding Tokyo soybeans to pigs; fish meal v. peanut meal for fattening pigs; a method of hardening peanut-fed hogs; factors retarding the growth of swine; the effect of various rations in relation to the production of soft pork; the returns secured from various types of pasture with sheep; changes in the meat and wool characteristics resulting from the use of purebred mutton rams on native ewes; the vitamin B (B_1) and G content of peanut, cottonseed, soybean, and linseed meals; the contents of vitamins A, B, and G in the principal varieties of soybeans and cowpeas grown in the State; menhaden fish oil as a source of vitamin D for chicks; the effect on production and cost of lighting laying pullets; and the effects of feeding yeast-fermented mash and replacing certain animal proteins in the laying mash with peanut meal on total egg production and hatchability of the eggs.

The nicotinic acid content of the blood of Mammalia, P. B. Pearson. (Tex. Expt. Sta.). (*Jour. Biol. Chem., 129 (1939), No. 2, pp. 491–494*).—A method is described for the determination of nicotinic acid in blood. Application of the method to samples of dog, pig, sheep, and horse bloods gave average values of 0.52, 0.47, 0.83, and 0.53 mg. of nicotinic acid per 100 cc. of blood, respectively. A rather wide range of values resulted for each of the species. Limited observations showed little difference in nicotinic acid values in the blood of sheep on relatively high and low levels of nicotinic acid intake. A single case is reported of a dog suffering from nutritionally induced blacktongue which showed an abnormally low blood nicotinic acid value.

Oats, peas, and flax as a combination crop, I, II (*Ohio Sta. Bimo. Bul. 199 (1939), pp. 103–106, 106–108*).—Two studies are presented.

I. *Possibilities as a dairy ration*, C. F. Monroe and C. C. Hayden.—In two trials with milking cows a mixture of oats, peas, and flax grown, harvested, threshed, ground, and fed together as the sole grain mixture was compared with the conventional mixture of ground yellow corn, ground oats, linseed meal, and wheat bran 4:3:2:1. Rather poor quality alfalfa hay and corn silage constituted the roughage for all lots. In each trial the average production of 4-percent fat-corrected milk and live weight gains were practically identical on the two rations, indicating the possibility of growing as a single crop a well-balanced dairy grain ration. Difficulties which may be encountered in growing the mixture and practical suggestions for securing a uniform mixture are discussed.

II. *Growing the mixture*, L. E. Thatcher.—Comparative yields of various cereals when grown alone and in combination with other crops are presented. The mixture of oats, peas, and flax yielded from 75.3 to 78 percent as much grain as oats alone.

Management of Sudan grass pasture, G. Bohstedt. (Wis. Expt. Sta.). (*Ind. State Dairy Assoc. Ann. Rpt., 49 (1939), pp. 36–40, figs. 4*).—Reporting on

an investigation to determine the factors involved in cyanide poisoning of livestock by Sudan grass, it is pointed out that short, dark green Sudan grass is generally high in cyanide and dangerous to pasture. When the Sudan grass attains a height of 2 ft. or more, whether first or second growth, it is low in cyanide content and relatively safe to feed. Also, when it is pale or yellowish green in color, regardless of height, it is relatively safe. A high level of available nitrogen and a low level of available phosphorus in the soil tend to increase the cyanide content, while high phosphorus and low nitrogen have the opposite effect. When short Sudan grass of high cyanide content is made into hay it is still a dangerous feed. A rapid test for determining the cyanide content of grass has been developed, and grasses suspected of containing dangerous levels of cyanide should be analyzed before being grazed.

Grass silage: A critical review of the literature, C. B. BENDER and D. K. BOSSHARDT. (N. J. Expt. Stas.). (*Jour. Dairy Sci., 22 (1939), No. 8, pp. 637–651*).—A comprehensive review of ensiling methods, the nutritive values of silages, and the effect of feeding various types of silage on the animal and its products. A bibliography of 114 references is included.

Dried citrus pulp as a cattle feed, J. M. JONES. (Texas Expt. Sta.). (*Cattleman, 26 (1939), No. 2, pp. 57, 58*).—In two separate cattle fattening trials at the Beeville (Texas) Substation, lots of cattle receiving a conventional-type fattening ration with ground ear corn as the principal concentrate were compared with lots in which dried citrus peel and pulp replaced from 25 to 60 percent of the corn in the rations. In each instance the groups fed the dried citrus pulp compared favorably in general condition, daily rate of gain, feed consumption per unit of gain, and dressing percentage with the corn-fed groups. In three of the four comparisons the dried pulp had a higher calculated net energy value than corn.

Phosphorus in Wyoming pasture, hay, and other feeds, O. C. MCCREARY (*Wyoming Sta. Bul. 233 (1939), pp. 20*).—Analyses are presented on the phosphorus content of a wide variety of feeds representative of the principal soil and rainfall areas of the State. These are classified as pasture and browse plants, hays, silages, and concentrates. It is concluded that a large proportion of the soils of the State are sufficiently high in phosphorus to produce plants of adequate phosphorus content. The phosphorus in the dry matter of plants was relatively high in those which grew rapidly, hence pastures in the heavier rainfall areas averaged higher in this element. The grasses, sedges, and rushes grown under comparable soil and rainfall conditions and collected at the same growth stage were similar in phosphorus content. A very favorable calcium: phosphorus ratio existed in these pasture plants and in hay made from them. The grain concentrates all proved to be relatively high in phosphorus.

Radioactive phosphorus as an indicator of phospholipid metabolism.—VII, The influence of cholesterol upon phospholipid turnover in the liver, I. PERLMAN and I. L. CHAIKOFF. (Univ. Calif.). (*Jour. Biol. Chem., 128 (1939), No. 3, pp. 735–743, fig. 1*).—Continuing this series (E. S. R., 81, p. 690), it was found that the addition of cholesterol to the diets of rats decreased the phospholipid turn-over in the liver within a relatively short period (30 hr.) after cholesterol feeding was initiated. The administration of choline to rats receiving cholesterol accelerated the phospholipid activity in the liver to a greater extent than in rats on the basal diet. The relation of these findings to the action of choline in preventing fatty livers is discussed. It appeared that the total phospholipid content of the liver is not necessarily an index of phospholipid activity or exchange.

The minimum vitamin A and carotene requirement of the rat, H. Goss and H. R. Guilbert. (Univ. Calif. and U. S. D. A.). (*Jour. Nutr., 18 (1939), No. 2, pp. 169–179*).—A vaginal smear technic was employed as a criterion for determining minimum vitamin A requirements in the course of the trials reported. Young female rats were depleted in vitamin A until individuals had shown continuous cornification of the vaginal smears for 5 successive days. They were then given graded levels of U. S. P. reference cod-liver oil, a commercial cod-liver oil, or carotene over the test period. The minimum level of vitamin A required to prevent vaginal cornification was found to be from 3.8 to 4.5 μg. or from 18 to 22 International Units per day per kilogram of body weight. Similarly the minimum carotene level was between 15 and 20 μg. daily per kilogram of body weight, which is only slightly lower than that required by domestic animals (E. S. R., 77, p. 830). No detectable storage of vitamin A was noted until 80 μg. of carotene per day per kilogram of body weight were given. The efficiency of carotene utilization decreased with increasing size of the dose. Simultaneous administration of bile salts with carotene slightly improved the efficiency of utilization. The adaptability of this technic to routine biological testing is discussed.

Studies on the structure of the chick antidermatitis factor, D. W. Woolley, H. A. Waisman, and C. A. Elvehjem. (Wis. Expt. Sta.). (*Jour. Biol. Chem., 129 (1939), No. 2, pp. 673–679*).—A more comprehensive report of research noted (E. S. R., 81, p. 695).

Conditions affecting the content of chick antidermatitis vitamin in yeast, W. H. Peterson and C. A. Elvehjem. (Wis. Expt. Sta.). (*Jour. Nutr., 18 (1939), No. 2, pp. 181–186*).—Yeasts grown in various media were assayed for potency of the chick antidermatitis vitamin by feeding graded levels of the yeast to chicks on a dermatitis-producing basal diet (E. S. R., 80, p. 90). Yeast grown on grain-wort, molasses-salts, and glucose-salts media gave protection against dermatitis when fed at 2-, 4-, and 6-percent levels, respectively. Commercial bakers' and brewers' yeasts also protected at the 2-percent level. It was shown that pantothenic acid, which appears to be identical with the chick antidermatitis factor, not only greatly stimulated yeast growth but also was a product of yeast growth.

Histological changes in skeletal musculature of paralyzed suckling young of E-low rates, I. R. Telford, G. A. Emerson, and H. M. Evans. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc., 41 (1939), No. 1, pp. 291–295, figs. 4*).—When suckling rats born of vitamin E-deficient mothers were nursed by the untreated mothers a high percentage developed some degree of paralysis, varying in severity from a slight impairment of gait to a complete loss of function of the hind limbs and a marked reduction in fore-limb action. The skeletal musculature of these paralyzed young rats invariably showed a progressive degeneration closely correlated with the severity of the paralysis. In cases where spontaneous recovery from the paralysis occurred a regeneration of the musculature was found to have taken place. Litter mates of those rats which received direct administration of wheat germ oil or nursed E-depleted foster mothers which were receiving wheat germ oil all remained in normal condition.

Determination of the anti-haemorrhagic vitamin, H. J. Almquist and A. A. Klose. (Univ. Calif.). (*Biochem. Jour., 33 (1939), No. 7, pp. 1055–1060, figs. 2*).—This further report (E. S. R., 81, p. 257) describes improvements in the procedure for vitamin K assay which enhance the accuracy of the test. The "prothrombin time" method of Quick (E. S. R., 80, p. 242) has been adapted for this purpose. It is shown that the reciprocal of the mean prothrombin

time, as well as that of the mean blood clotting time, bears a linear relation to the logarithm of the vitamin K level in the diet over a practical range of values.

The assay of vitamins K_1 and K_2, S. A. Thayer, R. W. McKee, S. B. Binkley, D. W. MacCorquodale, and E. A. Doisy (*Soc. Expt. Biol. and Med. Proc., 41 (1939), No. 1, pp. 194–197*).—The potencies of pure compounds of vitamins K_1 and K_2 were assayed by three different procedures. Expressed in terms of the authors' unit (E. S. R., 81, p. 406), vitamins K_1 and K_2 had potencies of approximately 1,000 and 600 units per milligram, respectively. Using a 7-day curative method similar to that described by Almquist et al. (E. S. R., 81, p. 257), 80 µg. of K_1 and 160 µg. of K_2 per kilogram of diet proved adequate.

Suggested formulas for special-purpose mixed feeds, F. D. Fuller (*Texas Sta. Cir. 84 (1939), pp. 21*).—This publication, containing suggested formulas for poultry, dairy, horse and mule, and pig and hog feeds supersedes Circular 63 (E. S. R., 67, p. 724).

First annual report of the feed control office of Arizona, W. T. McGeorge, E. O. Foster, and R. D. Taylor (*Arizona Sta. Bul. 164 (1939), pp. 337–431*).—This bulletin includes a brief discussion of the provisions of the Arizona Feeding Stuffs Law enacted at the 1937 legislative session, an explanation of the terms used in feed analysis, and definitions and average analyses of various feeding stuffs, along with the summary of guaranteed and found analyses of feeding stuffs registered in the State since July 1, 1937.

Digestibility studies with ruminants.—IV, Plane of nutrition and digestibility of corn silage, C. J. Watson, J. C. Woodward, W. M. Davidson, C. H. Robinson, and G. W. Muir (*Sci. Agr., 19 (1939), No. 10, pp. 622–651*).—Continuing these studies (E. S. R., 80, p. 524), three experiments were conducted with grade Shorthorn steers in which corn silage was fed at various levels either alone or with hay. In each trial the experimental steers were fed at each of the prescribed levels for one experimental period in a randomized fashion. Silage alone was fed in the first trial, hay and silage at a 4:5 weight ratio in the second, and a fixed amount of hay with increasing amounts of silage in the third. The data are presented in a detailed manner. In general, as the plane of nutrition increased, the digestibility of the organic matter, dry matter, crude fiber, and nitrogen-free extract in the silage decreased. The plane of feeding had no significant effect on the digestibility of nitrogen or ether extract. The decrease in digestibility from the lowest to the highest plane studied was equivalent to a money value loss of from 6 to 7 percent.

Legume silage vs. corn silage vs. legume hay for fattening cattle, G. A. Branaman and G. K. Davis (*Michigan Sta. Quart. Bul., 22 (1939), No. 1, pp. 34–39*).—In the trials reported, three lots of 10 steers each were compared over a 165-day feeding period. Lot 1, which received alfalfa-clover hay and corn throughout the trial and in addition cottonseed meal during the last 38 days, averaged 1.88 lb. daily gain per steer and consumed 615 lb. of corn, 12 lb. of cottonseed meal, and 682 lb. of hay per hundredweight gain. Lot 2, fed corn silage and alfalfa-clover hay balanced with cottonseed meal, gained 1.91 lb. daily per steer and consumed 117 lb. of cottonseed meal, 77 lb. of hay, and 2,721 lb. of silage per hundredweight gain. Lot 3, receiving alfalfa-clover silage instead of hay but otherwise fed as group 1, averaged 2.17 lb. daily per steer and consumed 531 lb. of corn, 11 lb. of cottonseed meal, and 1,734 lb. of silage per hundredweight gain. It is concluded that alfalfa-clover silage made with beet molasses (60 lb. per ton) is a more desirable feed for fattening steers than alfalfa-clover hay. The addition of cottonseed meal to the rations of lots 1 and 3 during the last 38 days resulted in more rapid gains. Somewhat

more than 1 lb. of grain daily per 100 lb. live weight was required to produce gains in lots 1 and 3 equivalent to that in lot 2.

A comparative biochemic study of the carotene of carabao and cattle with special reference to the differentiation of the meat of these animals, D. J. CABRERA and Z. DE JESUS (*Philippine Jour. Anim. Indus., 6 (1939), No. 1, pp. 5–42*).—A further report from this laboratory (E. S. R., 80, p. 240) presents evidence of a marked quantitative difference in the amount of carotene contained per unit weight of meat from cattle and carabao. Cattle consistently showed much higher values, and this served as a safe basis of differentiation of meats from these two types of animals. Carotene extraction methods are described. The differences were found to hold true in cured and even in cooked meat as well as in fresh samples. Proportionately more carotene occurred in the muscle than in the serum of the carabao, while the reverse was true for cattle. In each case it appeared to occur as a mere pigment deposit. A bibliography of 148 references is included.

Carbon dioxide research program, W. L. MALLMANN. (Mich. Expt. Sta.). (*Ice and Refrig., 96 (1939), No. 6, p. 454*).—Preliminary trials have indicated that the concentration of carbon dioxide in meat storage rooms may be maintained with a variation of less than 1 percent through the use of modern control equipment. Early findings on the effectiveness of various concentrations of carbon dioxide in the storage atmosphere for inhibiting microbial activity have been sufficiently promising to justify expansion of this research program.

Progress in shrinkage tests of growers' clips, R. H. BURNS. (U. S. D. A.). (*Natl. Wool Grower, 29 (1939), No. 7, pp. 17, 18, 28*).—Results are reported on a comparison of the accuracy of various types of samples taken from a wool clip for estimating the grade and shrinkage of the entire lot. With reference to grade, it was shown that the selection of every tenth bag of wool from the clip, or 10 bags spaced at intervals throughout the clip, each gave representative samples of the entire lot and were as reliable as samples secured by making up 10 bags from fleeces selected at intervals throughout the clip. The use of less than 10 bags did not give as representative a sample as the above methods. In shrinkage tests, sublots of wool consisting of 10 bags spaced at equal intervals throughout the clip and small samples taken from these sublots, as described, each gave shrinkage values within 2.2 percent of that for the entire lot, although there was a tendency for the smaller samples to give slightly higher values. The results gave encouragement in the program for finding a sampling method which will give representative shrinkage values.

Protein supplements for swine, Z. A. MASSEY (*Georgia Sta. Cir. 118 (1939), pp. 8+[1]*).—The results of a series of feeding trials comparing tankage, fish meal, and mixtures of tankage and cottonseed meal or tankage and peanut meal as protein supplements for fattening hogs are summarized. In a trial with heavy feeder pigs, those receiving a tankage-peanut meal mixture made more rapid gains and returned a greater margin over feed costs than groups receiving tankage alone or a tankage-cottonseed meal mixture. In a similar trial with young pigs having an initial weight of about 30 lb., those receiving a tankage-cottonseed meal mixture gave best results, followed in order by tankage alone and tankage and peanut meal, indicating that pigs under from 60 to 80 lb. live weight do not thrive on the peanut meal proteins. In a single trial fish meal proved superior to tankage, both with respect to rate of gain and efficiency of protein utilization. The addition of a protein supplement to the ration of pigs while grazing peanuts proved profitable.

Cottonseed meal for growing and fattening pigs in dry lot, W. L. ROBISON (*Ohio Sta. Bimo. Bul. 199 (1939), pp. 109–121*).—The results of a series

of feeding experiments are summarized to indicate that untreated cottonseed meal when fed as a sole protein concentrate to pigs in dry lot has a pronounced injurious effect, resulting in a higher percentage of deaths. It is further shown that supplying vitamin A in such rations does not overcome the harmful effects of the cottonseed meal. The method of manufacturing was shown to influence the feeding value of cottonseed meals. Untreated expeller meals were less toxic and were more efficiently utilized than hydraulic meals. The injurious effect of cottonseed meal was practically eliminated by moistening and autoclaving or by cooking with steam for 1 hr. under 14 lb. pressure and also by treating the meal with iron sulfate at the rate of about 3.4 lb. of this compound in solution per 100 lb. of meal. The toxic effect of cottonseed meal was markedly alleviated by the addition of tankage to the concentrate mixture. The efficiency of feed utilization increased as the ratio of tankage to cottonseed meal in the mixture increased. Other data on the value of iron-treated cottonseed meal when fed in combination with various other protein supplements are included.

Production of firm pork from peanut-fed pigs, E. H. Hostetler, J. O. Halverson, and F. W. Sherwood. (Coop. U. S. D. A.). (*North Carolina Sta. Tech. Bul. 61 (1939), pp. 44, figs. 5*).—The results of an extensive series of experiments involving some 50 different rations and a total of 90 lots of experimental pigs is summarized. A comparison of various fat constants as indexes of carcass grade showed a high correlation between grade and either the iodine number of the back or leaf fats or the melting point of back fat. Each of these proved superior to the refractive index of back fat, which has been used extensively for this purpose. A statistical treatment of the data brought out the high correlation between the degree of firmness of the carcass and the amount of peanut or other softening oils consumed by the pig. Starch consumption up to about 100 lb. per pig was important only as it reduced the amount of oil consumed, but above this amount the starch exerted an independent and definite hardening effect on the carcass fat. The initial weight of the pig, the total gain in weight, and length of the feeding period proved to be relatively minor factors in affecting the firmness of carcasses. Feeding a peanut ration followed by a hardening ration yielded a harder carcass than a single feeding period when the same total amounts of oil and starch were consumed. A comparison of the hardening effect of different starch feeds showed milo grain and sweetpotatoes were similar in effect to yellow corn, while brewers' rice produced firmer carcasses than corn. The addition of from 12 to 25 percent of cottonseed meal to a supplemented corn ration definitely resulted in harder carcasses than when no cottonseed meal was fed. A range of from 13 to 18 percent cottonseed meal was considered optimum. As a practical method of producing firm carcasses when peanuts are fed, it is recommended that the peanuts be fed to relatively small pigs (from 35 to 45 lb.), that not over 100 lb. of shelled peanuts per pig be fed, and that peanut feeding be discontinued and a hardening ration substituted when pigs reach a weight of from 90 to 100 lb., assuming that pigs will be slaughtered at a weight of about 225 lb. In general, the gain in weight during the hardening period should be about 3.5 times that during the softening period, and the starch consumption during hardening should be about 6.6 times the oil consumed during the softening period. This means that approximately 4 lb. of corn should be fed for each pound of shelled peanuts consumed.

Salt content of cured hams, R. C. Miller and P. T. Ziegler. (Pa. Expt. Sta.). (*Food Res., 4 (1939), No. 1, pp. 55–65, fig. 1*).—This further report (E. S. R., 79, p. 377) presents data on the salt content of center slices of

commercial hams and of experimentally cured hams (1) dry cured in a mixture of salt 8 lb., sugar 3 lb., and saltpeter 3 oz., applied at the rate of 1 oz. per pound of meat, and (2) brine cured in 75°- and 85°-sweet pickle made by dissolving the above mixture in water. The three lots of experimentally cured hams contained practically the same amount of salt, averaging 10.29 percent as compared with an average of 14.59 percent for the commercial hams. The relationship of the length of the curing period to the thickness of the hams in the case of brine curing is discussed.

Good pasture for work mules means less grain, hay, R. H. MEANS (*Miss. Farm Res.* [*Mississippi Sta.*], *2* (*1939*), *No. 8, p. 8*).—In a 3-yr. comparative test, work mules which had access to good pasture at night and on idle days consumed approximately 25 percent less grain and 50 percent less hay than their teammates which were constantly maintained on dry feed. The mules on pasture gained approximately 50 lb. more per head during the test period (April 28 to November 24) and appeared equally as efficient workers as the mules confined in dry lot.

Mineral tests in dog foods, H. H. MITCHELL. (Univ. Ill.). (*Flour & Feed*, *40* (*1939*), *No. 1, pp. 10, 11, 33*).—A popular discussion of various tests for evaluating dog foods, including analyses of the ration and certain biological responses to the diets.

A study of the energy required for maintenance, egg production, and changes in body weight in the domestic hen, S. BIRD and J. W. SINCLAIR (*Sci. Agr.*, *19* (*1939*), *No. 8, pp. 542–550*).—Data analyzed in this study consisted of detailed individual records of feed consumption, body weight, and egg production for 93 Barred Plymouth Rock hens over a period of about 9.5 mo. (December to September). Partial correlation coefficients showed that the weight of ingested feed was positively and significantly correlated to size of the body being maintained, volume of egg material being produced, and amount of change in body weight. Requirements for maintenance showed relatively high initial values indicative of high immature metabolism. They declined to their lowest values during April and May and then rose steadily for the remainder of the year. The efficiency of feed utilization for pure egg production ranged from about 75 percent in the somatically immature birds to about 60 percent subsequent to somatic maturity. The partial correlations between change in body weight and egg production were negative in all cases. They were of borderline significance when the birds were losing weight, but highly significant when gains in weight were made, indicating that the storing up of body reserves definitely inhibits egg formation. Total weight of weekly egg production was found to be independent of body weight.

Economic aspects of poultry keeping in Canada, with special reference to egg production, S. BIRD and J. W. SINCLAIR (*Sci. Agr.*, *19* (*1939*), *No. 8, pp. 551–564, figs. 6*).—In further studies differences in feed costs of various sizes of eggs amounted to 1.76 gm. or 4.3 percent feed per egg for every 1 oz. per dozen difference in size of eggs. Size of eggs for mature hens appeared to be genetically and environmentally uncomplicated by body size. Because of smaller maintenance requirements, the smallest possible bird giving maximum production of standard-sized eggs was considered the most desirable unit economically. Size of eggs from immature birds indicated that the ovary and oviduct apparently developed proportionately to body size. Average production for the birds studied (White Leghorn and Barred Plymouth Rock) was at the rate of about 52 percent for the year. Annual feed consumption was about 69 and 97 lb. per bird maintained in cages and 82 and 106 lb. for birds in pens for the White Leghorn and Plymouth Rock breeds, respectively. It was shown

that the Canadian producer receives about 67.9 percent of the price paid by consumers for eggs.

Phytic acid and mineral metabolism in poultry, R. H. Common (*Nature [London], 143 (1939), No. 3618, pp. 379, 380*).—This report from Queen's University, Belfast, indicates that phytic acid in the diet of laying pullets is a relatively poor source of phosphorus, since a considerable proportion of the ingested phytic acid remains unhydrolyzed. The presence of other minerals affects its hydrolysis, a higher proportion being hydrolyzed when it was supplemented with tribasic calcium phosphate than with calcium carbonate.

The pantothenic acid requirement of the chick, T. H. Jukes. (Univ. Calif.). (*Jour. Biol. Chem., 129 (1939), No. 1, pp. 225–231, figs. 3*).—Further confirmation of the probable identity of pantothenic acid and the filtrate (chick antidermatitis) factor is presented (E. S. R., 81, p. 695). It is estimated that approximately 1.4 mg. of pantothenic acid per 100 gm. of diet is required by the chick.

The comparative value of expeller and toasted solvent soybean oil meals for chicks, R. M. Bethke and M. C. Sweet (*Ohio Sta. Bimo. Bul. 199 (1939), pp. 122–125*).—These two types of soybean oil meal were compared as sources of protein for growing chicks when each was fed as the sole protein supplement and also when fed in combination with dried skim milk or a mixture of dried skim milk, meat scrap, and fish meal. In each instance the toasted solvent-extracted meal compared favorably with the expeller meal, both as regards rate of growth and the amount of feed required per unit of body gain.

Limit bone meal and limestone for chicks (*Colo. Farm Bul. [Colorado Sta.], 1 (1939), No. 3, p. 11*).—Research by H. S. Wilgus, Jr., and A. R. Patton indicating that excess calcium and phosphorus in the starter mash is reprecipitated in the intestinal tract of chickens and unites with the manganese, rendering it unabsorbable and thus creating a manganese deficiency, has led to the recommendation that excessive amounts of bonemeal and limestone in starter mashes for chicks, poults, pheasants, and other young birds should be avoided.

A statistical study of winter pause in White Leghorn pullets, I. M. Lerner and L. W. Taylor. (Calif. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 59 (1939), No. 3, pp. 199–210*).—Two populations of Single Comb White Leghorn pullets, one consisting of 768 individuals representing 20 sire families and the other consisting of 626 birds representing 17 sire families, were used in this study. All birds within these groups met certain prescribed requirements. Winter pause, as used here, is defined as the percentage of hen days from November to February spent in pauses of 7 days' duration or longer. The degree of pausing averaged 21.9 (range from 11.8 to 37.7 for various sire groups) and 11.4 for the two populations. In each case the percentage of birds pausing was of major influence in determining the degree of pausing in the population. In the former the duration of pause was significantly correlated with degree of pausing, while in the latter the frequency of pause was of greater significance than duration of pause. The genetic constitution of the birds, date of hatch, and season each exerted considerable influence on degree of pausing. The percentage of pausing birds in a family is suggested as a standard of selection in breeding against occurrence of winter pause.

Market egg grades as affected by humidity of farm egg storage rooms, D. C. Kennard and V. D. Chamberlin (*Ohio Sta. Bimo. Bul. 199 (1939), pp. 126–130*).—In a series of tests during the late winter and early spring months it was found that supplying supplemental moisture in egg storage rooms very markedly aided in maintaining a high quality of eggs and preventing a drop

in quality grade during storage. When eggs were held for 10 days at an average temperature of 49.4° F. and an average humidity of 38.2 percent, 92.3 percent of the eggs dropped from U. S. Extra to U. S. Standard grade. Similarly under storage at an average temperature of 52.3° and 76.8 percent relative humidity for 11 days, 100 percent of the eggs retained their grade as U. S. Extra, thus conclusively demonstrating the desirability of humidity control in egg storage rooms.

Cereal grains in turkey rations, W. E. POLEY and W. O. WILSON (*South Dakota Sta. Bul. 330 (1939), pp. 31, figs. 5*).—Trials extending over 4 yr., involving a total of 19 lots of young turkeys, were conducted to compare the relative efficiency of corn, wheat, oats, and barley when each was used as the principal grain in the starting, growing, and finishing rations of turkeys. There was no appreciable difference in the rate of growth or rate of mortality when any one of these grains was used in the growing and finishing rations. On the basis of the feed required per unit of gain during the growing period, wheat, barley, and oats had values of 99, 98, and 89.3, respectively, as compared with corn at 100. Similar tests with finishing rations indicated values of 101, 87.7, and 96.2 for wheat, barley, and oats, respectively. Turkeys produced on the wheat, barley, or oats rations graded equally as high, showed more uniform carcass color, and were preferred by the graders as compared with the corn-fed lots.

Breastbones of turkeys in relation to roosting, M. O. NORTH (*Wyoming Sta. Bul. 232 (1939), pp. 12, figs. 4*).—In trials extending over a 4-yr. period the amount of breastbone indentation was determined for turkeys which were allowed to roost at various ages and on various types and widths of roosts. All poults were reared under uniform conditions and on well-balanced rations adequate for normal growth and calcification of bones. Turkeys roosting on a 4-in. pole roost showed less breastbone indentation than those roosting on 1-, 2-, 4-, or 6-in. flat roosts or 4- and 6-in. roosts tilted at a 7° angle. The 4- or 6-in. roosts tilted at a 20° angle resulted in approximately the same amount of deformity as the 4-in. pole roosts. Permitting poults access to roosts at an early age (4 weeks) increased the tendency toward dented breastbone. The pole roosts were best suited for early roosting. The breastbones of males showed a greater degree of indentation than females, but there was no correlation between weight and degree of indentation within the sexes.

Seventh World's Poultry Congress and Exposition, Cleveland, Ohio, July 28 to August 7, 1939, Proceedings (*Baltimore: Waverly Press, 1939, pp. XII+551, figs. [105]*).—These proceedings contain the 8 addresses delivered at the general assembly and 165 technical papers given in the various scientific sessions, including 30 in the section of genetics and physiology; 32 in nutrition and incubation; 31 in pathology and disease control; 26 in economics, including marketing; 24 in public service and general; and 22 in poultry products research.

The congress has been discussed editorially (E. S. R., 81, p. 465).

DAIRY FARMING—DAIRYING

[Investigations in dairying in the Southern States] (*Assoc. South. Agr. Workers Proc., 40 (1939), pp. 89–91, 93–98*).—Abstracts of the following papers are listed in these proceedings: Making and Feeding Grass and Other Silages, by T. W. Woodward (U. S. D. A.); Progress in Feed Control, by D. S. Coltrane; Artificial Insemination Program for the Improvement of Livestock, by J. R. Allgyer (U. S. D. A.); Sire Records as Secured by the Analysis of Dairy Herd Improvement Association Records, by R. G. Connelly (Va. A. and M. Col.);

Feed Flavors and Practical Means of Controlling Them in Dairy Products, by C. E. Wylie and T. B. Harrison (Univ. Tenn.); Significant Trends of Manufactured Products in the South, by J. W. Boehr; and Southern Cheese Problems, by F. E. Hanson (Tex. A. & M. Col.).

[Dairy cattle investigations in North Carolina], C. D. Grinnells, R. L. Lovvorn, and R. E. Stitt (*North Carolina Sta. Rpt. 1938, pp. 66–72, figs. 2*).—Included are brief progress reports (E. S. R., 80, p. 97) on the following studies: The value of lespedeza and *Lespedeza sericea* as supplementary pasture crops for dairy cattle, the returns secured from variously fertilized dairy cattle pastures, the effect of date of harvest on the yield and composition of meadow hays, the value of the whole peanut plant in the dairy ration, the digestibility of *L. sericea* as determined with goats and dairy heifers, and the economy of feeding beet pulp to dairy cattle.

High records contrasted with unselected records and with average records as a basis for selecting cows, J. C. Berry and J. L. Lush. (Iowa Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 8, pp. 607–617, figs. 3*).—The records of 115 Holstein cows, each of which had completed at least six Herd Improvement Registry lactations and had one or more daughters each with at least two complete records, were analyzed in this study. Based on the degree of correlation between different single records and the averages of various combinations, it is concluded that averages of all available records are more dependable than either selected or unselected single records for evaluating differences between cows.

List of sires proved in dairy herd improvement associations, 1939 (*U. S. Dept. Agr., Misc. Pub. 353 (1939), pp. 105*).—This supplements previous lists (E. S. R., 80, p. 98) with the names and summarized records of 1,348 sires whose records were tabulated between April 1, 1938, and April 1, 1939.

Factors affecting the milk production of Simmenthaler grade cows under the penkeeping system, G. G. Carneiro (*Iowa State Col. Jour. Sci., 13 (1939), No. 3, pp. 249–268, figs. 6*).—This study, conducted at Iowa State College, consisted of a detailed statistical analysis of some 30 years' production records of a Brazilian herd of Simmenthaler grade cows. The mean age of the heifers at first calving was 38.7±0.3 mo., while cows ended their productive usefulness at an average age of 112.5±2 mo. The month of calving showed no significant influence on milk yield. The small influence of the age of the cows on the milk yield was considered unimportant practically. The length of the lactation period had the most pronounced effect on total milk yield, the relation being practically linear. The service period had little practical influence on milk production when considered apart from the length of the lactation period. The length of the lactation period showed a significant decrease with advancing age. When lactation periods were standardized to 305 days, 44 percent of the variance in milk yields was due to permanent differences between individual cows, including inheritance and permanent environment.

Soybeans as a source of fat in the dairy ration, L. A. Maynard, K. E. Gardner, and A. Hodson ([*New York*] *Cornell Sta. Bul. 722 (1939), pp. 30, figs. 2*).—Two double reversal feeding experiments were conducted to compare concentrate mixtures containing ground soybeans with mixtures containing solvent-extracted heat-treated soybean oil meal plus starch to replace the removed fat. Cows of the Jersey and Holstein breeds were used. Mixed hay and corn silage were fed to all lots, and all feeds were fed at commonly accepted levels. The ground soybean ration and the soybean oil meal ration contained 5.27 and 3.35 percent fat, respectively, in the first trial and 6.23 and 3.09 percent fat, respectively, in the second trial. Cows on the high fat rations con-

sistently showed an advantage in the amount of 4-percent fat-corrected milk produced, with these increases primarily attributable to the higher milk yield rather than to a pronounced increase in the butterfat content of the milk. The soybean mixture proved fully as palatable as the soybean oil meal, and there was no evidence that the metabolism of the animals was upset by the higher fat intake. These results substantiate previous findings at this laboratory that a certain level of fat intake is important from the standpoint of maximum milk and fat production, and show that ground soybeans are a satisfactory and practical source of the fat needed.

The vitamin D of alfalfa and prairie hay and its utilization by dairy cows, G. C. Wallis. (S. Dak. Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 8, pp. 599–606*).—Representative samples of alfalfa hay and prairie hay assayed by the standard line-test procedure were found to contain 1.1 and 0.55 International Units of vitamin D per gram, respectively. When these hays were fed to comparable lots of dairy cows, butterfat from the alfalfa-fed group was more potent in vitamin D than that from the group receiving the prairie hay, which in turn was more potent than butterfat from the control group receiving beet pulp. In any case the percentage recovery of ingested vitamin D from the milk was very low, ranging from 1 to 2 percent.

The effect of the ingestion of irradiated yeast, molds, and ergosterol on the antirachitic potency of ewe's milk, W. G. Kirk. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci., 13 (1939), No. 3, pp. 235–238*).—Lactating ewes maintained on a typical winter ration produced milk of relatively low vitamin D potency. Exposing the ewes in one group to summer sunshine and green pasture did not increase the antirachitic potency of the butterfat, and irradiating the faces of ewes with ultraviolet rays was only slightly effective in this respect. Adding irradiated ergosterol, irradiated yeast, or irradiated molds to the basal diet markedly increased the antirachitic potency of the milk. The irradiated ergosterol was approximately one-half as efficient for this purpose as the yeast or molds when fed at equivalent levels.

[Papers presented at the fifteenth and sixteenth annual conferences of the New York State Association of Dairy and Milk Inspectors] (*N. Y. State Assoc. Dairy and Milk Insp., Ann. Rpts., 11 (1937), pp. 229, figs. 11; 12 (1938), pp. 288, figs. 12*).—The following listed papers were presented at Utica, N. Y., September 22–24, 1937 (E. S. R., 77, p. 690): Brucellosis as a Public Health Problem, by C. M. Carpenter (pp. 9–11); The Effect of Mastitis on the Quality of Milk, by D. H. Udall (pp. 13–18) (Cornell Univ.); Mastitis Control in Columbia County, by R. E. Nichols (pp. 19–27); Is Bovine Mastitis a Public Health Problem, by P. B. Brooks and W. D. Tiedeman (pp. 29–36); Newer Knowledge of Milk Flavors, by O. F. Garrett (pp. 43–55) (N. J. Expt. Stas.); "Hit-or-Miss" Methods of Controlling Washing and Sterilizing, by F. M. Scales (pp. 57–76); Organisms of the Colon Group in Pasteurized Milk, by N. J. Hohl (pp. 77–81); The Practical Value of the Phosphatase Test for Pasteurization, by F. W. Gilcreas and W. S. Davis (pp. 83–92); Directions for Performing the Phosphatase (Phosphomonoesterase) Test for Pasteurization (pp. 96–100); The Clipping of Dairy Cows and Its Relation to a Quality Product, by J. H. Mills (pp. 101–108); The Proper Stabling of Dairy Animals, by H. F. McDonald (pp. 113–118); Milk Plant Water Supplies and Plumbing Hazards, by C. A. Holmquist (pp. 135–142); Milk Plant Waste Disposal and Drip Saving, by J. W. Mitten (pp. 145–150); Preliminary Results of a Sanitary Survey of Milk Cans, by G. A. West (pp. 153–164); and Sanitary Aspects of Paper Milk Containers, by J. R. Sanborn (pp. 177–181) (N. Y. State Sta.).

The following listed papers were presented at Rochester, N. Y., September 14–16, 1938: Methods of Handling Utensils on the Dairy Farm, by H. J. Brueckner (pp. 13–28) (Cornell Univ.); Latest Developments in Cooling Milk on the Dairy Farm, by J. E. Nicholas (pp. 29–36) (Pa. Sta.); Modern Rapid Sediment Testing and Suggested Standards, by J. Drew (pp. 37–44); Sanitary Control of Milk From Producer to Consumer Through Coordination of Laboratory and Inspection Work, by S. H. Harrison (pp. 53–66); Problems in the Processing and Marketing of Homogenized Milk, by P. H. Tracy (pp. 69–84) (Univ. Ill.); Dairying in New Zealand, by G. J. Hucker (pp. 85–90) (N. Y. State Sta.); A Study of Pasteurized Milk in Rochester, New York, Employing the Phosphatase Test, by H. W. Leahy (pp. 91–100); Oxygen in Milk and Its Relation to Destruction of Vitamin C and the Development of the Oxidized Flavor, by E. S. Guthrie, D. B. Hand, and P. F. Sharp (pp. 101–110) (Cornell Univ.); Nutritional Aspects of Milk, by W. E. Krauss (pp. 111–118) (Ohio Sta.); State Regulations Covering the Fat Testing of Milk, by W. F. McDonough (pp. 121–127); Some Problems in Can Washing and Can Washers, by C. W. Weber (pp. 129–154); A Survey of the New York Metropolitan Grade A Milk Supply From the Producers' Standpoint, by K. A. Shaul (pp. 157–172); and Reduction of Milk Losses in Milk Plants, by A. C. Dahlberg, J. C. Hening, and H. L. Durham (pp. 187–194) (N. Y. State Sta.).

Latest developments in cooling milk on the dairy farm, J. E. NICHOLAS. (Pa. Expt. Sta.). (*Jour. Milk Technol., 2 (1939), No. 3, pp. 141–146, figs. 8*).—The latest designs in dairy farm milk-cooling equipment are described and illustrated, along with brief data on the rate of cooling of milk in 10-gal. cans under specified conditions.

Reduction of milk losses in milk plants, A. C. DAHLBERG, J. C. HENING, and H. L. DURHAM. (N. Y. State Expt. Sta.). (*Jour. Milk Technol., 2 (1939), No. 2, pp. 96–99*).—A more complete report of work previously noted (E. S. R., 81, p. 267) is presented.

Factors affecting the composition of milk, D. H. JACOBSEN and G. C. WALLIS (*South Dakota Sta. Bul. 331 (1939), pp. 28+[1], figs. 11*).—Data are presented on the butterfat, total solids, ash, calcium, and phosphorus contents of normal milk samples from cows of the Holstein, Ayrshire, Jersey, and Guernsey breeds over a 5-yr. period. The greatest number of Holstein samples were around 3 percent butterfat and from 10 to 11 percent total solids, Guernsey samples 4.5 percent butterfat and 14 percent total solids, and Jersey samples from 5 to 5.5 percent butterfat and from 14 to 15 percent total solids. In all breeds the fat test decreased to the end of the third month and then increased as the lactation period advanced. Jerseys and Guernseys reached their highest level at the end of lactation, but Holsteins averaged significantly higher at the beginning of the lactation period than at the end. A pronounced lowering of the fat content of milk during the summer months was noted, with lowest values occurring in August and highest in December and January. The effect of both season and stage of lactation on total solids content showed the same general trend as on butterfat levels. Holstein milk was frequently below the legal standards for both butterfat and solids-not-fat during the summer months, and the average solids-not-fat percentage was below the legal standard throughout the year. The mineral content was lowest in Holstein milk and highest in Jersey milk. In general, the ash, calcium, and phosphorus decreased during the first month of lactation, remained fairly constant until the last 3 mo., and then steadily increased to the end of the milking period. Some seasonal effect on mineral elements was evident, with lower values occurring in the summer months.

Graphic estimation of milk protein and milk energy, W. L. GAINES. (Ill. Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 8, pp. 619, 620, fig. 1*).—A graphic design is presented for estimating the amount of 4-percent fat-corrected milk (*FCM*), the amount of protein, and the therms of milk energy in a given weight of milk (*M*) containing a specified amount of butterfat (*f*). This design is based on the following relations: $FCM = M\ (0.4+0.15f)$ and 100 lb. *FCM*=3.4 lb. protein=34 therms of milk energy.

The fluorine content of various fractions of milk and commercial caseins, R. J. EVANS and P. H. PHILLIPS. (Univ. Wis.). (*Jour. Dairy Sci., 22 (1939), No. 8, pp. 621, 622*).—A commercial whole milk was found to contain 0.204 p. p. m. of fluorine while the constituent parts contained, respectively, casein 0.053, heat-coagulable protein 0.012, ether extract 0.012, and the residue 0.145 p. p. m., indicating that the flourine is largely contained in the aqueous phase. A number of commercial caseins were found to range from 4 to 359 p. p. m. of fluorine, indicating contamination in the higher fluorine samples. The advisability of using such contaminated casein for nutritional purposes is questioned.

Free and bound vitamin B_1 in milk, J. HOUSTON and S. K. KON (*Nature [London], 143 (1939), No. 3622, p. 558*).—A study at the National Institute for Research in Dairying gave evidence that after incubation of raw milk or reconstituted dried milk with taka-diastase at pH 3.7–4.0 the fluorimetric assay of vitamin B_1 was almost doubled. A similar increase in vitamin B_1 resulted from peptic digestion even when the phosphatases of milk had been inactivated by heating, leading to the suggestion that in addition to free vitamin B_1 there is present in milk a B_1 protein complex. It appeared that the bound vitamin B_1 could not be adsorbed but was a constituent of the protein molecule.

The irradiation of milk, K. G. WECKEL and H. C. JACKSON (*Wisconsin Sta. Res. Bul. 136 (1939), pp. [2]+55, figs. 54*).—This bulletin is a comprehensive summary of the present information on the irradiation of milk, dealing with the physical basis underlying the irradiation process, the procedures and biological effects involved in irradiation, and factors which research have shown to be important in the design of irradiation equipment. Numerous types of irradiators are described and illustrated. The radiation emanating from various types of arcs are shown to possess qualitative and quantitative differences. The characteristics of the milk film, the intensity of irradiation, and the distance of the milk film from the source of irradiation each exerted a very significant influence on the final vitamin D content of the irradiated milk. It is recognized that excessive and unnecessary exposure to radiation may cause destruction of certain constituents of the milk, but by proper control of the irradiation process the desired amounts of vitamin D may be obtained without producing such effects. Eighty-five references to the literature are cited.

Investigations of the use of the resazurin test for grading milk, F. E. NELSON. (Kans. State Col.). (*Jour. Bact., 38 (1939), No. 2, p. 235*).—The variability in behavior of the different brands of dye when used in the resazurin test is again noted (E. S. R., 81, p. 704). When aseptically drawn milk from individual quarters of cows was subjected to this test, some correlation was found between the number of leucocytes present and the sequence of color changes of the dye, but no correlation was found between the presence of mastitis streptococci and the color changes of the dye. Many factors were shown to be operative in determining the course of dye reduction when this test is applied to the grading of market milk. Need for further standardization of the test is stressed.

The rapid identification of Streptococcus agalactiae, A. H. Brueckner and S. E. Hartsell. (Purdue Univ.). (*Ind. Acad. Sci. Proc., 54 (1938), pp. 35–45*).—A rapid microscopic agglutination test for group B streptococci is described in this report. Comparative results showed a high correlation between this method and biochemical tests for the identification of *S. agalactiae*. Freshly isolated strains of this organism were successfully identified by the agglutination method in 98 percent of the cases. Both practical and specialized applications of this test are discussed.

Slow acid production by butter cultures, F. E. Nelson, L. A. Harriman, and B. W. Hammer (*Iowa Sta. Res. Bul. 256 (1939), pp. 217–287*).—Three lines of approach were followed in the experiments described: (1) The effect of milk used in making butter cultures on the rate of acid production, (2) the effect of the butter culture used as inoculating material on rate of acid production, and (3) studies of the ultrafiltrable principle causing decreased acid production by butter cultures.

The source of milk used for propagation was shown to be unimportant as a cause of slow acid production in butter cultures. Further evidence indicated that the cause of slow development was in the inoculating material and that the delayed acid production was a result of a reduced rate of growth of the organisms. The distribution of organisms among the butter culture species showed no marked irregularity in slow butter cultures, and pure strains of *Streptococcus lactis* isolated from such cultures commonly coagulated milk at a normal rate. Bacteria-free filtrates from slow butter cultures when added to fresh *S. lactis* cultures or butter cultures usually markedly restrained acid production and multiplication of the organisms. This same reaction occurred with filtrates from some apparently normal cultures. These bacteria-free filtrates varied widely in their abilities to inhibit growth of different strains of *S. lactis*, and the inhibitory principle active against *S. lactis* did not affect cultures of *Lactobacillus casei*, citric acid-fermenting streptococci, or *S. liquefaciens*. The inhibitory principle in such filtrates multiplied on sensitive strains of *S. lactis* roughly in proportion to the number of sensitive cells present. Segregation of individual strains of inhibitory principle from the mixtures commonly occurring in filtrates from butter cultures was possible, and under proper conditions of pH, temperature, medium, and titer of the filtrate the inhibitory principle caused lysis of a suspension of the organisms of a sensitive strain. The inhibiting principle was heat labile and could be inactivated by crystal violet, methylene blue, hydrogen peroxide, and potassium permanganate. It was not destroyed by freezing and was only slightly affected by desiccation. This principle showed the general characteristics of a bacteriophage. No method was found for the elimination of the phage from a butter culture. Strains of *S. lactis* not sensitive to the filtrates could be successfully combined with citric acid-fermenting streptococci to form good butter cultures.

A survey of Michigan master buttermakers contest for 1937–38, J. M. Jensen (*Michigan Sta. Quart. Bul., 22 (1939), No. 1, pp. 20–32, figs. 3*).—The quality score, composition, and yeast and mold content of 328 lots of butter submitted by competing butter makers during the year are summarized.

Studies on the fat of Cheddar cheese, C. B. Lane and B. W. Hammer. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci., 13 (1939), No. 2, pp. 149–155*).—Earlier findings on flavor constituents of Cheddar cheese (E. S. R., 73, p. 525) led to these additional studies on the fat. Flavor suggestive of ripened cheese was contained in the fat of aged Cheddars. The acid numbers of fats from aged Cheddar cheese were higher than those of fats from sweet cream butter

but lower than those of fats from Roquefort-type cheese. Acid numbers of raw milk cheese were higher in the fresh cheese and increased more rapidly with aging than those from pasteurized milk cheese. Also volatile acidities of the raw milk cheese were consistently higher than those of pasteurized milk cheese throughout a 200-day ripening period. Values for the former tended to decrease slightly after 90 days, while those for the latter continued to increase. Flavors of both the raw and pasteurized milk cheeses were satisfactory after 200 days' ripening, although the latter were somewhat lacking in typical flavor, suggesting that the differences in rate of increase of acid number may explain the differences in ripening qualities of the two lots. Oily residues obtained from ether-extracted distillates of aged Cheddars had "cheesy" aromas suggestive of the higher volatile fatty acids. Data are included on the distribution of fatty acids in butterfat and in sodium chloride solution.

Flavor contributors of Swiss-type cheese, F. J. Babel and B. W. Hammer. (Iowa Expt. Sta.). (*Food Res., 4 (1939), No. 1, pp. 81–85*).—Swiss-type cheeses of different qualities were subjected to steam distillation. Cheese having a pronounced characteristic sweet flavor yielded a much higher volatile acidity than cheese lacking in flavor. The addition of calcium or sodium propionate to process Swiss-type cheese lacking in flavor gave it a sweet flavor and a texture and color more like natural Swiss cheese, suggesting that the propionates are important flavor contributors of Swiss-type cheese.

Symposium on frozen desserts (*Jour. Milk Technol., 2 (1939), Nos. 2, pp. 73–90; 3, pp. 118–129, 130–137, figs. 3*).—A symposium on frozen desserts was held in connection with the annual meeting of the American Public Health Association, where the following papers were presented: What Are Frozen Desserts? by F. W. Fabian (pp. 75–83) (Mich. State Col.); Notes on Microbiological Analysis of Ice Cream, by A. H. Robertson (pp. 84–86); Sediment Tests on Frozen Desserts, by M. E. Parker (pp. 87–90); Sanitation of Products Added to Frozen Desserts, by P. H. Tracy (pp. 118–126); and Public Health Aspects of Fruits, Nuts, Colors, and Extracts Used in Frozen Desserts, by M. J. Prucha (pp. 127–129) (both Univ. Ill.); Condensed and Evaporated Milk With Reference to Ice Cream, by P. A. Downs (pp. 130–132) (Univ. Nebr.); and Sanitary Control of Dried Milk, by P. S. Prickett (pp. 133–137).

Use of stabilizers in unagitated ice creams, L. S. Bentley and B. M. Watts. (Univ. Calif.). (*Food Res., 4 (1939), No. 1, pp. 101–111*).—The effects of various stabilizing agents on the flavor, body, and texture of refrigerator-frozen ice creams were compared. Rennet was not an effective stabilizer. Increasing the total solids through additions of dried skim milk, chocolate, corn sirup, or increased sugar exerted some stabilizing action. Egg yolk and India gum had a marked stabilizing effect but were otherwise undesirable. Gelatin, pectin, and agar each exerted a marked stabilizing action, with the latter producing the best refrigerator ice cream under the conditions outlined. The effect of the various stabilizers on sherbets and frozen fruit salads is also briefly discussed, and recipes are given for refrigerator vanilla, maple, and chocolate ice creams, using pectin or other stabilizers.

Flavoring characteristics of individual cocoa varieties, P. S. Lucas and I. A. Gould (*Michigan Sta. Quart. Bul., 22 (1939), No. 1, pp. 12–17*).—Seven varieties of cacao beans were compared with reference to pH, ash and fat contents, and flavor-imparting qualities when the prepared chocolate was incorporated in ice creams. The ash and fat contents were very similar for all varieties, but variations ranging from 5.3 to 6.03 occurred in the pH. Consumer preference for flavor of chocolate varieties in ice creams favored the stronger

varieties of beans having chocolate flavor of the bitter type. In the opinion of the authors, the practice of manufacturers in blending several varieties of cacao beans to produce a brand suited to a specific use is fully justified.

VETERINARY MEDICINE

Index-catalogue of medical and veterinary zoology.—Part 3, Authors: C to Czygan, A. Hassall, M. A. Doss, M. M. Farr, G. B. Carson, and D. Beeo (*U. S. Dept. Agr., 1939, pp. [1]+613–961*).—A continuation of this index catalog (E. S. R., 79, p. 246).

Practical identification of endoparasites for veterinarians, J. H. Whitlock (*Minneapolis, Minn.: Burgess Pub. Co., [1938], pp. [2]+III+37, figs. 25*).—This mimeographed work consists of 10 keys for identification of the internal parasites of domestic animals, arranged by organs infested, and a key to parasites causing cysts. A list of 14 of the more important monographic works in English on the taxonomy of parasites is included.

The effect of sulfanilamide on experimental infections with Bacterium necrophorum in rabbits, E. S. Hemmens and G. M. Dack (*Jour. Infect. Diseases, 64 (1939), No. 1, pp. 43–48, figs. 3*).—In work reported sulfanilamide gave good results in the treatment of rapidly fatal infections with *Actinomyces necrophorus* in rabbits. "In order to get maximum effect and ultimate cure it was necessary to start treatment by the third day of the infection or earlier, and to continue treatment until the lesion had regressed. The effect of the drug was to stop the spread of the necrotic process. Histologically, there was a connective tissue wall infiltrated with heterophile leucocytes in the animal treated for 4 days or longer. This process went on to complete encapsulation if treatment was continued. There were fewer bacteria in the abscess of the treated as compared with the untreated animal. The mode of spread of the infection seemed to be through the blood vessels."

Studies on saliva and salivary glands for the presence of Brucella abortus, C. P. Fitch, W. L. Boyd, and L. M. Bishop. (Minn. Expt. Sta.). (*Cornell Vet., 29 (1939), No. 3, pp. 338–340*).—Studies of 134 samples of saliva from 39 reacting cattle and the salivary glands of 36 other animals indicate that saliva is not an important source of elimination of *B. abortus* from the animal body.

The use of sulfanilamide in experimental brucellosis, B. D. Chinn (*Jour. Infect. Diseases, 64 (1939), No. 1, pp. 78–82*).—The in vitro and in vivo experiments reported have shown sulfanilamide to have a bactericidal and bacteriostatic effect on *Brucella melitensis*, *B. abortus*, and *B. suis* in vitro. It was found to have a protective action in 100 percent of guinea pigs inoculated with these organisms when treatment was commenced immediately after inoculation. "Sulfanilamide has a definite therapeutic effect in *Brucella*-infected guinea pigs when treatment is begun 1 week after inoculation. From 50 to 100 percent of the animals (depending upon the type of organisms inoculated) were negative pathologically and culturally after treatment, while untreated animals were all positive for *Brucella* and showed characteristic lesions. Infections in guinea pigs due to *B. abortus* and *B. suis* respond more satisfactorily to sulfanilamide treatment than do *B. melitensis* infections."

Listerella encephalitis or encephalomyelitis in domestic animals, R. Graham. (Univ. Ill.). (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. 750, pp. 289–292, figs. 2*).—This contribution on listerellosis or *Listerella* encephalitis and/or encephalon n of the brain and cord of ruminants, is p s to the literature. It is

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said that the recognition of this disease in cattle and sheep in certain middle western States does not imply a new disease or one which practitioners will recognize as new, but one they have recognized by other designations. The first established outbreak in Illinois (1937–38) came to attention in a group of some 200 shipped-in western feeder lambs. "In outbreaks of *Listerella* encephalitis occurring in Illinois, the causal organism has been isolated from the brain stem only of naturally infected animals. A diagnosis of the disease has been made only upon the identification of the invading organism. . . . A summary of the susceptible hosts indicates that sheep, cattle, goats, rabbits, gerbilles, foxes, chickens, and man have suffered from spontaneous infections, while rabbits, guinea pigs, and chickens have proved convenient in establishing pathogenesis in the laboratory diagnosis of this disease."

Effect of anti-encephalomyelitis serum on subsequent production of active immunity with encephalomyelitis vaccine, W. S. GOCHENOUR, JR. (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. 750, pp. 374, 375*).—The author concludes from the experiments reported that it is inadvisable to administer "the first injection of encephalomyelitis vaccine simultaneously with or earlier than 2 weeks subsequent to the administration of encephalomyelitis antiserum when attempting to extend the immunity conferred by the serum with active immunity by the use of vaccine."

A growing yeast medium for the cultivation of hemophilic bacilli, J. P. DELAPLANE and H. O. STUART. (R. I. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. 750, pp. 326–328*).—Description is given of a blood-free medium utilizing live, growing yeast to furnish the necessary growth factors of *Hemophilus gallinarum* and *H. influenzae*. "The medium results in a better growth of the organisms than that obtained with a chicken-blood medium. Vaccines prepared from the yeast-grown cultures do not offer any encouragement for vaccinating chickens against infectious coryza. The value of the yeast medium for growing hemophilic organisms for other studies is suggested."

The resistance of avian tubercle bacilli to low temperatures, with especial reference to multiple changes in temperature, P. KYES and T. S. POTTER (*Jour. Infect. Diseases, 64 (1939), No. 2, pp. 123–134*).—The authors' experiments demonstrate "that tubercle bacilli (avian) not only may survive the temperature of liquid air and even several freezings, as practiced by [H.] Swithinbank,[4] but that they may survive also when rapid freezing and thawing is accomplished 20, 40, 80, and even 200 times. . . . In addition . . . a similar result obtains when both the freezing and the thawing are accomplished at a distinctly slow rate. We have found, as did Swithinbank, that viable organisms, although invariably present after freezing and thawing, are distinctly reduced in their power to multiply in culture and to produce rapidly progressive disease in susceptible animals. When one considers that tubercle bacilli may survive the lowest obtained temperature, that of liquid helium (−269° to −272° C.), as demonstrated by [E.] Kadisch,[5] and also may survive freezing by liquid air (−192°), repeated 200 times as in our own experiments, there follows the realization that these organisms possess extreme power of retaining their viability in the presence of adversely low temperatures."

An estimate of a suitable infective dose of Br. abortus for immunisation tests on cattle, A. D. MCEWEN, F. W. PRIESTLEY, and J. D. PATERSON (*Jour. Compar. Pathol. and Ther., 52 (1939), No. 2, pp. 116–128*).—Report is made of an experiment designed to estimate a suitable number of viable *Brucella abortus*

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[4] Roy. Soc. [London], Proc., 68 (1901), No. 450, pp. 498–503.

[5] Med. Klin., 27 (1931), Nos. 29, pp. 1074–1076; 30, pp. 1109–1112, figs. 2.

organisms which might be used to test the immunity of vaccinated cattle. The necessity for estimating this dose is discussed.

Localization of Brucella abortus in the bovine uterus, C. P. FITCH, W. L. BOYD, L. M. BISHOP, and M. KELLY. (Minn. Expt. Sta.). (*Cornell Vet.*, *29* (*1939*), *No. 3*, *pp. 253–260*).—Report is made of the results of bacteriological examinations of the uteri of cattle condemned for slaughter under the Federal-State testing program. "Ninety-three nongravid uteri were examined. *B. abortus* was isolated from 51 percent. Twenty-seven of the 93 showed evidence of recent parturition, and *B. abortus* was isolated from 23, or 85 percent. Sixty-six uteri showed no evidence of recent parturition, and *B. abortus* was found in 24, or 36 percent. Forty-one gravid uteri were examined. *B. abortus* was not found in any uterus with a pregnancy of less than 4.5 mo. and was found in 13, or 45 percent, of pregnancies of 4.5 mo. or over. Evidence is presented to show that *B. abortus* may be found in the nongravid uterus long after involution is completed. The maximum length of time that this organism was found was 195 days. There is possible indication that animals do not readily conceive if *B. abortus* is present in the uterus even though there is no macroscopic evidence of disease."

The demonstration of immunity in cattle vaccinated with a nonvirulent strain of Br[ucella] abortus, A. D. MCEWEN (*Jour. Compar. Pathol. and Ther.*, *52* (*1939*), *No. 2*, *pp. 129–131*).—Report is made of an experiment in which the immunity of two small groups of vaccinated cattle was tested. The findings provide confirmatory evidence regarding the suitability of an infective dose of $1,460 \times 10^6$ organisms applied to the surface of the eye.

Bovine mastitis: Cause, detection, and control, L. W. SLANETZ, C. L. MARTIN, and K. S. MORROW (*New Hampshire Sta. Cir. 55* (*1939*), *pp. 7*, *figs. 2*).—A practical account.

A filtrable virus isolated from mastitis cows, J. BROADHURST, G. CAMERON, and M. E. MACLEAN (*Cornell Vet.*, *29* (*1939*), *No. 3*, *pp. 261–270*, *figs. 18*).—Reference is made to a similarity of bovine mastitis due to *Streptococcus agalactiae* and scarlet fever, particularly in the relative ineffectiveness of sulfanilamide or related drug treatment, its administration in scarlet fever being of value only when used with convalescent serum, as reported by W. Thalhimer.[6] The isolation by J. Broadhurst and G. Cameron of a filtrable virus from the blood of each of eight cases of scarlet fever[7] is referred to.

The results of tests made of the filtrable virus hypothesis by two different procedures, namely, (1) a careful and meticulous microscopic study of the cells present in fresh mastitis milk, searching specifically for inclusion bodies, and (2) tissue culture inoculations with filtrates of the blood and the milk of mastitis cows, are then reported. They resulted in the isolation of a filtrable virus from the blood and from the milk of mastitis cows. The virus was carried through 32 serial transplants in tissue cultures. Injected tissue cultures transplanted into mice caused inflammation of the lymph nodes and mammary glands of the mice, and from them the virus was reisolated. Inclusion bodies characteristic of viruses in general were demonstrable in the affected cells in milk, in tissue cultures, and in inoculated mice.

Infectious bovine mastitis.—VII, Characteristics of udder staphylococci, W. N. PLASTRIDGE, E. O. ANDERSON, L. F. WILLIAMS, and F. J. WEIRETHER ([*Connecticut*] *Storrs Sta. Bul. 231* (*1939*), *pp. 60*).—In this the seventh of the series (E. S. R., 79, p. 393) the characteristics of udder staphylococci and the

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[6] Bul. N. Y. Acad. Med., 2. ser., 14 (1938), No. 6, pp. 361–373, figs. 5.

[7] Jour. Bact., 35 (1938), No. 1, p. 46.

relation of their various properties to evidence of mastitis are dealt with. The results reported relate to (1) the leucocyte and chloride content of "normal" samples and samples containing staphylococci, (2) some biochemical characteristics of udder staphylococci, (3) the ability of udder staphylococci to coagulate human and bovine blood plasma, and (4) routine examination of milk for pathogenic udder staphylococci. The contribution is presented with a five-page list of references to the literature.

The value of the Hotis test in detecting mastitis streptococci in milk, J. M. MURPHY. (N. J. Expt. Stas.). (*Cornell Vet., 29 (1939), No. 3, pp. 279–286*).—Report is made of the results of the application of the Hotis test (E. S. R., 76, p. 391) each month for a period of 11 mo. to quarter and composite samples of milk from 140 cows in 1 herd in New Jersey. In addition to the Hotis test a cultural study of the milk was made using blood agar plates. When streptococci were found they were identified on differential media.

"In recording the Hotis reactions a modification of a classification devised by Miller and Johnson [E. S. R., 80, p. 395] was used. It was found that regardless of the color of the column of milk after incubation at 37° C. for 24 hr. only a thick yellow deposit in the bottom of the tube or yellow colonies (sometimes referred to as flakes) adhering to the sides of the tube could be considered positive. The Hotis test detected 94.86 percent of the quarter samples and 96.1 percent of the composite samples containing mastitis streptococci similar to those of Minett's group I. The quarter test was positive to 24.7 percent, and the composite test was positive to 5.9 percent of the samples containing streptococci other than those belonging to Minett's group I. False positive reactions were secured in 1.05 percent of the quarter samples and 0.4 percent of the composite samples that did not contain streptococci. Obviously, the Hotis test, as here interpreted, could not be relied upon to indicate the presence of mastitis streptococci in 95 percent of cases unless the streptococci were of Minett's group I. If infection with streptococci of other groups greatly predominated in the herd, the efficiency of the test might be reduced to as low as 10 percent. In herds where the type of infection was not diagnosed bacteriologically the exact value of the test would be unknown."

The effect of sulfanilamide on bovine mastitis streptococci, R. B. LITTLE (*Cornell Vet., 29 (1939), No. 3, pp. 287–294, figs. 2*).—The results of the treatment of mastitis streptococci in five cows with sulfanilamide, which included the daily bacteriological examination of the fore milk before, during, and after treatment, are reported. "When from 108 to 1,361 gm. (3 lb.) per cow of sulfanilamide were administered the drug failed to destroy the streptococci in the affected quarters, although during treatment the numbers of streptococci and leucocytes appearing in the milk were greatly reduced. In acute mastitis (group I) the daily administration of the drug may aid in alleviating the acute symptoms, but repeated attacks may be expected to occur, since the development of the streptococci is only temporarily retarded."

The effect of sulfanilamide therapy upon bovine mastitis as indicated by laboratory tests, W. G. HOGE, W. V. HALVERSEN, and V. A. CHERRINGTON. (Idaho Expt. Sta.). (*Jour. Infect. Diseases, 64 (1939), No. 1, pp. 27–35*).—In work commenced in the spring and summer of 1937, several cases of acute and chronic mastitis were treated. Blood agar plate counts and Breed smears were made from the milk from each quarter of five experimental animals to determine the effect of the medication upon the disease. "The concentrations of sulfanilamide in the blood, milk, and urine of the cows were determined to establish any relationship between the amount present in the body fluids and the effect produced upon the condition of the udder. Case histories of the cows receiving

the therapy are given, and a short qualitative experiment showing the effect of sulfanilamide upon mastitis organisms in vitro is described. The cows tested tolerated doses of 5 gm. per 100 lb. body weight per day (the dose often prescribed in human infections). In some cases this dose was doubled without producing serious symptoms of toxicity. Uniform blood and milk concentrations of the drug are well maintained by only two or three daily doses. The counts of bacteria in the milk were much reduced during medication in all cases, and in most cases the milk was temporarily rendered nearly or completely sterile by the drug. Improvement in the clinical picture and in the milk was noted in the one case of acute mastitis tested. There was no permanent improvement in the udder as revealed by the bacteriological examination of the milk or by the leucocyte count in any of the cases studied. No positive general statement can be made as to the effect of sulfanilamide upon the numbers of leucocytes in the milk of treated cows. These experiments indicate that there is probably a decrease in numbers. Sulfanilamide in litmus milk cultures of mastitis organisms markedly inhibits the action of the organisms upon the milk. The effect of the drug in vivo appears to be much greater than in vitro."

The alleged protective action of alfalfa against the hemorrhagic sweetclover disease, W. K. Smith. (U. S. D. A. and Wis. Expt. Sta.) (*Jour. Agr. Res.* [*U. S.*], *59* (*1939*), *No. 3, pp. 211–215*).—In the course of experimental testing of the toxicity of various spoiled sweetclover hays there were marked differences observed in the susceptibility of rabbits of similar age to sweetclover disease. Susceptible animals became somewhat less susceptible with advancing age, while resistant animals maintained their resistance. It is suggested that this variation in a group of rabbits is an expression of the inherent constitution of the animals and not the result of previous diet. Small amounts of alfalfa fed as a supplement to a diet of toxic hay have not protected rabbits against the disease. Although the studies of A. J. Quick[3] led to the conclusion that 5 percent of alfalfa in a diet of toxic sweetclover hay prevents the development of any symptoms of toxicity, the author's results indicate that even 12 percent has no significant effect in checking the progress of the disease.

The occurrence and prevalence of gastrointestinal helminths in apparently healthy cattle in Queensland, Australia, F. H. S. Roberts (*Jour. Compar. Pathol. and Ther.*, *52* (*1939*), *No. 2, pp. 160–165*).—In an examination of the alimentary tract of 237 apparently healthy young cattle, helminths, representing 29 species, were found present in 97.13 percent. "The most frequently encountered species were *Haemonchus contortus* (86.7 percent), *Ostertagia ostertagi* (75.2 percent), *Bosicola radiatum* (75.6 percent), *Cooperia pectinata* (78.2 percent), *C. punctata* (72.3 percent), *Strongyloides papillosus* (57.8 percent), and *Bunostomum phlebotomum* (44.5 percent). Counts or estimations of the numbers of each species were made in every animal."

Some histopathological changes in the skin of cattle infected with larvae of Hypoderma lineatum, S. W. Simmons. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc.*, *95* (*1939*), *No. 750, pp. 283–288, figs. 18*).—The principal histopathological changes resulting from invasion of the skin of cattle by the common cattle grub are described and illustrated.

Careful handling of feeder lambs is best method of preventing coccidiosis losses, A. W. Deem (*Colo. Farm. Bul.* [*Colorado Sta.*], *1* (*1939*), *No. 2, pp. 17–19*).—It is pointed out that no cure is known after coccidiosis has once developed in lambs. Close confinement, excess of grain in ration, and lowered resistance may make sheep susceptible.

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[3] Amer. Jour. Physiol., 118 (1937), No. 2, pp. 260–271, figs. 2.

Brucella abortus infection of goats, T. M. DOYLE (*Jour. Compar. Pathol. and Ther., 52 (1939), No. 2, pp. 89–115*).—Twelve of 48 pregnant goats tested for susceptibility by conjunctival infection with measured doses of *B. abortus* carried their kids to term and 36 aborted. "Sixty-three blood cultures were made from 40 goats artificially infected with *B. abortus*, and 3 positive results were obtained. This finding is in marked contrast with the high percentage of positive blood cultures obtained from goats infected with *B. melitensis*. Two experiments were carried out in which pregnant goats were placed in contact with goats recently aborted. The pregnant goats kidded normally, but 3 showed agglutination titers after kidding and *B. abortus* was isolated from the fetal membranes of 2 of them. The tissues of 11 artificially infected goats were examined at varying periods after infection for the presence of *B. abortus*. The organism was recovered from 5 animals 113, 128, 182, 241, and 386 days, respectively, after infection. *B. abortus* was still present in the milk of 4 goats 114, 216, 259, and 386 days, respectively, after infection. Two strains of *B. abortus*, of bovine origin, were subjected to serial passage in goats and tested subsequently for pathogenicity on in-calf heifers and guinea pigs. There was no marked change in the pathogenicity of the strains as the result of passage through goats."

Studies on hog-cholera virus, J. ZICHIS (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. 750, pp. 272–277*).—The experimental procedure of the transmission of hog-cholera virus from sheep to sheep, from sheep to pig, and from pig to sheep by cohabitation, the passage of the virus through sheep, and its passage through a calf are reported on, the details being given in two tables. "The results of these experiments strongly indicate that sheep and possibly cattle may become carriers of hog-cholera virus, and in view of this it is entirely possible that these animals may play an important part in the epizootiology of hog cholera."

Effects of heat on phenolized hog-cholera virus, J. D. RAY and G. E. WHIPPLE (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. 750, pp. 278–282*).

Lymphocytoma or lymphoid leucemia in a pig, H. R. HESTER and R. GRAHAM. (Univ. Ill.). (*Cornell Vet., 29 (1939), No. 3, pp. 334–337, figs. 3*).

A microscopic agglutination test for the diagnosis of swine erysipelas, L. G. KARLSON and S. H. MCNUTT. (Iowa State Col.). (*Jour. Infect. Diseases, 4 (1939), No. 1, pp. 49–51*).—A description is given of a microscopic agglutination test which was found by the authors to be more reliable than other agglutination tests previously reported.

Incoordination of Equidae: Wobblers, W. W. DIMOCK and B. J. ERRINGTON. (Ky. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. 750, pp. 261–267, figs. 9*).—The authors conclude that the constriction of the cervical spinal canal, the spondylarthritis, and the degenerative changes in the spinal cord and in the spinal nerves which have been found in equine wobblers warrant consideration as significant factors. "The correlation between them and their relative importance to the disease is uncertain. Some hope lies in a chemical analysis of the bone, a further histopathological study of the bones, nerves, and cord, a correlation of these with the clinical picture, and a more thorough knowledge of the nutritional requirements of Equidae."

A note on the occurrence of Br. abortus agglutinins in farm horses in the east of Scotland, A. W. TAYLOR (*Jour. Compar. Pathol. and Ther., 52 (1939), No. 2, pp. 140–143*).—Tube agglutination tests of the serums of 957 horses from agricultural districts in the east of Scotland for *Brucella abortus* are reported. Agglutinins were detected in 188 in a serum dilution of 1/10, in 21 in a serum dilution of 1/20, and in 19 in a serum dilution of 1/40 or more. Negative reac-

tions to the test were obtained from 769 horses. "If those which showed the presence of agglutinins in a serum dilution of 1/10 are classed as negative, it would appear that neither sex nor age have a statistically significant influence upon the agglutination titer."

Equine encephalomyelitis, H. W. SCHOENING. (U. S. D. A.) (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. 750, pp. 268–271, 272*).—A summary of the status of knowledge of this disease, presented at the annual meeting of the American Veterinary Medical Association held in Memphis, Tenn., in August–September 1939.

Report on equine enzootic encephalomyelitis at the Kansas State Veterinary College clinic, S. J. ROBERTS and G. R. MOORE (*Cornell Vet., 29 (1939), No. 3, pp. 270–278*).—The results of observations and treatment of 151 cases of equine encephalomyelitis that occurred in Kansas during the summer of 1938, of which 120 were at the hospital and 22 treated as ambulatory cases, are reported. The chick embryo vaccine, which was applied to 128 animals, gave the most promising results in the prevention and control of the disease.

Control of equine strongylosis.—I, The effect of natural factors on the development of strongylosis in foals, D. W. BAKER, G. W. SALISBURY, and J. W. BRITTON (*Cornell Vet., 29 (1939), No. 3, pp. 297–308*).—Report is made of work carried on with a group of horses consisting of seven purebred Percheron and five purebred Belgian blood mares and their foals which, with the exception of one mare who lost her foal, were the only horses kept on the pasture during the length of the experiment. The average rate of pick-up of strongyle infection by foals under natural conditions was found to be 1 in 32,000,000 of potentially infective larvae. The average rate of pick-up for the Belgian and Percheron foals, respectively, was 1 in 52,600,000 and 1 in 17,000,000 of potentially infective larvae. Overwintering of eggs on pasture was apparently lethal to 68 percent of the eggs in manure deposited normally and 100 percent of the eggs in feces which were spread in a thin layer. An apparent age resistance to *Ascaris equorum* and *Strongyloides westeri* was demonstrated.

Trichostrongylosis in equines, J. W. BRITTON. (Univ. Calif.). (*Cornell Vet., 29 (1939), No. 3, pp. 322–330*).—In the work reported "*Trichostrongylus axei* was demonstrated in the stomachs of 72 percent of the 50 horses examined. The heaviest infections were observed in the farm horses of central California, while the infections of the majority of the wild range horses were conspicuously light. A rather distinct correlation was demonstrated between the severity of the adult *T. axei* infections and the severity of the gastric lesions. Heavy infections with *T. axei* produce a chronic catarrhal gastritis in horses and mules. The *Habronema* sp. encountered in this survey produced no pathological lesions other than an excessive production of mucus. The repeated egg count-larval culture method appears to be the most accurate way to diagnose trichostrongylosis. Differential leucocyte counts are of limited value. Transmission of an equine strain of *T. axei* to a 17-month-old Jersey steer was demonstrated."

A highly fatal disease of horses, H. A. HOFFMAN (*Calif. Dept. Agr. Bul., 28 (1939), No. 4, pp. 284–287, figs. 2*).—Report is made of case studies of an acute, highly fatal disease of horses that occurred in Yolo County, Calif., in the fall of 1938. The preliminary studies failed to identify the condition as infectious, as there were negative bacteriological findings and a failure to infect laboratory animals. The heavy infestation with *Strongylus vulgaris* and *S. equinus* suggests the possibility of mass invasion of their larval forms; however, this factor as a causative agent was not definitely determined. The high incidence of various types of internal parasites has prompted precautionary measures

for their control in an effort to determine their possible significance as causative agents. The condition can be distinguished from Borna disease on the basis of a very short duration of the disease and, further, the fact that the cellular inclusions were in the cytoplasm of the brain cells, whereas in Borna disease the inclusions are intranuclear.

Index of diagnosis (clinical and radiological) for the canine and feline surgeon, with treatment, H. Kirk (*London: Baillière, Tindall & Cox, 1939, pp. VI+561, figs. 287; rev. in Cornell Vet., 29 (1939), No. 3, pp. 343, 344*).—This work was prepared as an aid in differential diagnosis. It deals with symptomatology insofar as to enumerate such objective signs as are characteristic of the condition under review and which therefore become of importance in differential diagnosis. The causes of individual symptoms or abnormalities, as distinct from those of specific or classical diseases, are dealt with in greater detail. In addition, a brief summary of the latest and most appropriate treatment has been appended.

Hobday's surgical diseases of the dog and cat, edited by J. McCunn (*London: Baillière, Tindall & Cox, 1939, 4. ed., pp. VII+395, figs. 311*).—This is the fourth edition of a work that was first published in 1900.

The use and possible effects of live virus-vaccine as a means of preventing distemper on fox and mink farms, E. A. Watson (*Canada Dept. Agr. Pub. 649 (1939), pp. 4*).

[Work in avian pathology by the North Carolina Station] (*North Carolina Sta. Rpt. 1938, pp. 56–59, 62, 63*).—The work of the year (E. S. R., 80, p. 109) briefly referred to includes a study of the hematology of the fowl, by F. W. Cook; studies on paratyphoid infection in pigeons, by H. C. Gauger and R. E. Greaves; investigation of septicemic diseases among fowls in North Carolina—a search for a "virulence" antigen in *Salmonella pullorum* and *S. gallinarum*, and studies on normal agglutinins, both by Greaves; and the identification of tapeworms infesting fowl of North Carolina and their relationship to leg weakness and blindness of fowl, by R. Harkema and Gauger.

How to recognize and combat some of the more common diseases of Colorado poultry, F. Thorp, Jr. (*Colo. Farm Bul. [Colorado Sta.], 1 (1939), No. 3, pp. 3–5*).—A practical account, with particular reference to fowl paralysis, pullorum, and laryngotracheitis.

The effect of sulfanilamide on the course of experimental avian coccidiosis, P. P. Levine (*Cornell Vet., 29 (1939), No. 3, pp. 309–320*).—The results of feeding experiments with sulfanilamide for coccidiosis control, the details of which are given in three tables, together with a description of an effective new technic for making oocyst counts in chicken feces, are presented.

"Sulfanilamide fed at the rate of 0.3 gm. daily to chickens (weight 1.5 lb.) had no effect on the course of infection with *E*[*imeria*] *tenella*. Similar treatment of birds infected with a mixture of *E. mitis*, *E. acervulina*, and *E. necatrix* prevented the development of oocysts of the two former species but had no effect on the latter species. Sulfanilamide fed at the rate of 0.3 gm. daily to chickens (weight 1.5 lb.) practically completely suppressed the discharge of oocysts of *E. praecox*, *E. mitis*, *E. hagani*, and *E. maxima*. A few days after the drug was discontinued, oocysts apeared in the feces, and the oocyst count reached a peak considerably below that of the controls. Sulfanilamide, when mixed in the mash in concentrations of 0.1, 0.2, 0.3, 0.4, and 0.5 percent by weight, prevented the normal weight gain of growing chickens. Sulfanilamide in concentrations of 0.1 percent and 0.2 percent had no effect on the production and discharge of oocysts of *E. hagani* and *E. praecox*, respectively. Sulfanilamide in the mash in concentrations of 0.3 percent by weight had a marked inhibitory effect on the

oocyst discharge of birds infected with *E. mitis*, *E. praecox*, and *E. hagani*. This coccidiostatic effect was evidenced as long as the drug was fed. Cessation of sulfanilamide feeding was followed by an increase in the oocyst counts not equaling (one exception) the counts of nontreated control birds."

Studies on certain filtrable viruses.—II, Immunization against fowl pox with fowl- and pigeon-pox viruses cultivated in vivo and in vitro, C. A. Brandly and G. L. Dunlap. (Univ. Ill.). (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. 750, pp. 340–349*).—In experiments conducted in continuation of this work (E. S. R., 77, p. 253) bacteria-free, egg-propagated, and tissue-cultured, as well as skin-lesion (bacteria-carrying), fowl and pigeon viruses were employed to determine "their value for immunization of chickens against fowl pox. The former appear[ed] to possess several points of superiority. The chorioallantoic membranes of 12-day eggs were found to be more susceptible to infection with fowl and pigeon virus than was the skin of chickens 6 to 12 weeks old. Furthermore, the egg-propagated virus material (chorioallantoic membrane lesions) almost invariably was found to be richer in virus than the tissue-cultured and the skin-lesion virus material tested. Large intramuscular doses of the bacteria-free forms of virus appeared to show less tendency to cause undesirable constitutional reactions in vigorous 8- to 12-week-old chickens than did the bacteria-contaminated skin-lesion virus material. As compared to the lesions produced in the chorioallantoic membranes of 12-day chicken eggs by fowl-pox virus, the pigeon-virus lesions showed much greater cellular proliferation and much less tendency to necrosis and secondary metastatic foci. Passage of one strain of fowl pox virus through 68 series of developing eggs over a period of about 2 yr. did not appear to bring about any significant change in virulence for chickens or the chorioallantoic membrane of developing eggs."

A list of 21 references to the literature is given.

The viability and immunizing value of egg-propagated laryngotracheitis virus, F. R. Beaudette and C. B. Hudson. (N. J. Expt. Stas.). (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. 750, pp. 333–339*).—In studies made of laryngotracheitis, tenth generation egg virus dried and held in vacuo under refrigeration "maintained its potency and immunizing power in laboratory experiments over a period of 421 days, even when used at the rate of 1 mg. per cubic centimeter of diluent. This virus also gave equally good results in field trials when used at the rate of 20 mg. per cubic centimeter. Twenty-fifth generation virus retained its immunizing power, but in the experiments the smaller doses employed gave inconsistent results."

A list of 10 references to the literature is included.

The nature of fowl paralysis (neurolymphomatosis), F. Blakemore (*Jour. Compar. Pathol. and Ther., 52 (1939), No. 2, pp. 144–159, pls. 5*).—In work reported fowl paralysis (neurolymphomatosis) was eliminated by inbreeding from a strain of fowls derived from badly affected stock. "The progeny were still highly susceptible as shown by the occurrence of the disease following injection of tissues from natural cases and exposure to natural infection. In addition to the occurrence of typical lesions of neurolymphomatosis the injected and exposed fowls became unthrifty and developed atypical lesions in the viscera, especially the liver and heart. Passage experiments from the atypically affected fowls were carried out in the course of which the infective agent became raised in virulence and gave rise to an acute disease. The early lesions in the heart and liver were inflammatory in character, and in some of the survivors a true lymphomatous response was found. A study of the lesions in all stages of the infection indicates that in all probability the disease, popularly termed fowl paralysis, or neurolymphomatosis, is the chronic stage of an acute infection. The

nature of the infecting agent is now being studied. The results of the investigation are in keeping with observations made in naturally occurring outbreaks of fowl paralysis and leave little doubt concerning the infective nature of the disease."

Variability of the fowl pest virus [trans. title], F. C. KRANEVELD and A. NASOETION (*Nederland. Indische Bl. Diergeneesk., 51 (1939), No. 2, pp. 104–114; Ger., Eng. abs., pp. 113, 114*).—The so-called Brescia strain of the fowl pest virus proved to be transmissible from mouse to mouse with absolute certainty by intracerebral injection, the virus spreading out through the entire body. Its pathogenicity for chickens was reduced somewhat by intracerebral passages through mice, but when the hundredth mouse-passage strain was again passed through chickens, it rapidly regained its original virulence for the fowl.

Nineteenth annual report on eradication of pullorum disease in Massachusetts, H. VAN ROEKEL ET AL. (*Massachusetts Sta. Control Ser. Bul. 98 (1939), pp. 12*).—Further progress was made during the testing year 1938–39 (E. S. R., 80, p. 827) in the eradication of pullorum disease. A marked increase in the amount of testing resulted in an increase of the percentage of reactors to 0.34 as compared to 0.17 the preceding year. Of 571,065 chickens in 355 flocks in 12 counties tested, 2,115 in 28 flocks gave positive reactions. All of 8,730 tests (5,033 routine and 3,697 experimental) of other fowl, including 5,144 turkeys and 21 pheasants, were negative. The necessity for annual testing is emphasized by the detection from time to time of infection in flocks previously negative. The results of testing during the 19-yr. period that the eradication work has been under way are tabulated. The increase in the percentage of total birds which exist in nonreacting flocks, from 9.77 percent in 1920–21 to 82.15 percent in 1938–39, is pointed out as the outstanding achievement.

Serologic types of Salmonella isolated from paratyphoid in chicks, E. JUNGHERR and C. F. CLANCY. ([Conn.] Storrs Expt. Sta.). (*Jour. Infect. Diseases, 64 (1939), No. 1, pp. 1–17*).—In the routine examination of 1,241 lots of chicks less than 3 weeks old, made at the station laboratory from September 1930 to February 1938, 15 cases of paratyphoid infection were observed as contrasted with 470 cases of pullorum disease and 756 of nonspecific disorders. "While the symptoms of paratyphoid were more or less indefinite, the lesions ranged from inconspicuous alterations to those of omphalitis, peritonitis, pericarditis, and sacculitis. In some instances tumefaction or focal necrosis of the liver suggested a specific septicemic disease. The navel appeared to be a possible portal of entry of the infecting organism. From the epidemiologic standpoint, it was noteworthy that 10 of the 15 cases occurred in known pullorum-clean stock, a circumstance which places special emphasis upon the differential diagnosis of avian salmonelloses. In three instances identical serotypes could be demonstrated in follow-up specimens from the same stock or the same premises, after periods varying from 1 to 25 mo. In 14 cases which were included in the serologic study, 4 of the isolated organisms were classified, according to the Kauffmann-White scheme, as *S. typhimurium*, 2 as *S. typhimurium* var. *binns*, 1 as *S. bareilly*, 2 as *S. oranienburg*, 3 as *S. montevideo*, 1 as *S. london*, and 1 as *S. anatum*. A human strain obtained from the feces of one of the authors while this work was in progress was typed as *S. typhimurium*. An analysis of the antigenic structure of *S. montevideo* was carried out which confirmed the original conception of Hormaeche, namely, that the organism belongs to the VI, VII group, and is monophasic in character. The specific phase was found to contain factors *m t g o s*, of which *g o s* were deficient in absorbing capacity. An ill-defined phase variation was observed in that small smooth colonies consisting of rod-shaped elements contained pri-

marily the serologic factors m t, with the others poorly developed, while similar smooth but larger colonies consisting of many filamentous elements contained the full complement m t g o s. According to the literature, all of the serotypes but *S. anatum* which were observed in chicks have been found associated with gastrointestinal disturbances in man. The irregular maltose fermenting subtype of *S. typhimurium* var. *binns* is considered to be an important cause of paratyphoid in pigeons. *S. bareilly*, *S. montevideo*, and *S. london*, as far as is known, have not been reported previously as occurring in either man or animals in this country."

Vesicular dermatitis in chickens, H. A. Hoffman (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. 750, pp. 329–332, figs. 5*).—Report is made on an acute outbreak of vesicular dermatitis that involved the unfeathered skin of the head, feet, and shanks of hens. "One attack of the disease failed to confer an immunity, as evidenced by the fact that the disease recurred in the same individuals approximately 5 weeks following the onset of the first symptoms. Cultural examinations of affected birds consistently yielded staphylococci from lesions on the head and feet and, in one instance, from the liver of affected birds. Other types of organisms, apparently contaminants, were found in some of the cultures. Exudate from the lesions on affected birds, as well as cultures of the staphylococcus, when rubbed into scarified skin of healthy birds resulted in vesicle formations in 12 out of 20 inoculations made. Pen contact, feeding tests, and subcutaneous inoculations were negative. The mild type of lesions produced by inoculation tests and the failure of these lesions to spread after the manner observed in natural cases preclude definite conclusions with respect to the etiological significance of the organisms studied. Comparative studies were made with staphylococci obtained from cases of arthritis in chickens and from a case of impetigo in man. Inoculations with these cultures into scarified skin of healthy chickens resulted in lesions indistinguishable from those obtained with cultures from the acute vesicular dermatitis case."

Hexamita sp. from quail and from chukar partridges, E. McNeil, E. D. Platt, and W. R. Hinshaw. (Univ. Calif. et al.). (*Cornell Vet., 29 (1939), No. 3, pp. 330–333*).—This is a preliminary report on the presence of *Hexamita* sp. in California valley (*Lophortyx californica vallicola*) and Gambel's (*L. gambeli gambeli*) quail and in chukar partridges (*Alectoris chukar*). "The species of *Hexamita* found in quail very closely resembles the one found in pigeons and turkeys. The species from turkeys has been transmitted to California valley quail, but preliminary attempts to transmit the quail type to turkey poults and chicks have failed. Attempts to transmit the species found in the chukar to turkey poults were successful. In these studies, many of the specimens examined were suffering from ulcerative enteritis, and although the parasites were abundant in the ulcerative areas, it has not been shown that they have any etiological relationship to the disease. A few quail, however, have shown a pathological and protozoan picture similar to that found in infectious catarrhal enteritis of turkeys. The incidence of distribution of *Hexamita* in the intestinal tract of the quail include the ileum, jejunum, duodenum, bursa of Fabricius, and cecum in the order given."

AGRICULTURAL ENGINEERING

Hydraulics of open ditches, J. G. Sutton. (U. S. D. A.). (*Agr. Engin., 20 (1939), No. 5, pp. 175–178, 180, figs. 5*).—The design of open drainage ditches for various conditions is described as developed by the Bureau of Agricultural Engineering.

Runoff from small drainage basins, D. B. KRIMGOLD. (U. S. D. A.). (*Agr. Engin., 19 (1938), No. 10, pp. 439–446, figs. 8*).—This is a technical analysis of studies and some of the results thereof being conducted by the Soil Conservation Service.

A method of measuring runoff velocity as related to soil movement between terraces, E. G. DISEKER. (Ala. Expt. Sta.). (*Agr. Engin., 20 (1939), No. 5, pp. 195, 196, figs. 2*).—Experiments conducted by the station on a method for measuring the run-off velocity and related soil movements between terraces as a basis for terrace spacing involved the use of an experimental area consisting of four pairs of partially controlled plats of representative Cecil clay.

Tests were conducted on 50-ft. plat lengths having slopes of 5, 10, 15, and 20 percent and widths of 15 ft. Each slope was tested on freshly plowed plats, firm, smooth fallow plats, on plats planted to oats in 10-in. contour rows, and on plats planted to Austrian winter peas in 18-in. contour rows. A test on a half plat (25-ft. length) under identical conditions followed immediately, but only these two slope lengths were used as previous tests showed that the time variation of run-off concentration was slight for 12.5-ft. slope length with the apparatus used. The same plat for the 25- and 50-ft. slope lengths was used for a particular condition because the companion plats were in different crops and tillage conditions. The rate of artificial rain used on these tests was 6.8 acre-in. per hour for a period of 6 min.

In general, the greatest soil losses occurred during the first increment of rain. This was due to a certain amount of slaked or loose soil that was easily washed off the plats. For this reason, consecutive tests on the same plats will not give comparable erosion losses. Curves plotted of velocity and soil losses for the different plat-slope conditions revealed that losses increased when the velocities increased, but varied to such an extent that no specific relation could be obtained from the curves. This was true because in many instances the rate of losses increased rapidly when velocity increased, but during the next increase of velocity the rate of soil losses decreased. This shows that the rate of soil movement is dynamic and may be explained as follows: The soil that is loose or in a comparatively erodible state may be carried off by the first increment of run-off or partially deposited in the lower portion of the slope and then carried off by the next increment of run-off. In some cases it may require considerable time for the rain to loosen the soil before it can be moved. At times the soil is in a loose state, but the surface is irregular and the run-off water will fill the depression with soil before appreciable soil is lost.

The tests revealed that in 2 instances the velocity was doubled when the slope was increased 4 times, in which case the soil movement was increased about 15 times. This occurred on 50-ft. slope lengths of oats and winter pea plats. On the freshly plowed plats of the same slope length the velocity on the 20-percent slope was 1.3 times greater than on the 5-percent slope and the movement of soil 7.6 times that on the 5-percent slope.

Velocity of water flowing across a uniform slope of soil reached a constant under any set of conditions after the maximum run-off occurred, but the time required to reach the maximum run-off depended on the condition of the surface of the soil and crops grown. This is based on the fact that the run-off rate will finally approximately equal the rate of rainfall.

It appears that the method developed is applicable for measuring run-off and calculating slope velocity as related to soil movement but will require refining before highly accurate data can be obtained.

Water-holding capacity of soils and its effect on irrigation practices, F. J. VEIHMEYER and A. H. HENDRICKSON. (Calif. Expt. Sta.). (*Agr. Engin.,*

19 (1938), No. 11, pp. 487–490, figs. 4).—An analysis of studies being conducted by the station indicates that a knowledge of the total amount of water soils will hold shortly after irrigation, the field capacity, must be supplemented by a determination of the residual water in the soil in contact with the roots of plants at the time the plants permanently wilt, the permanent wilting percentage.

An approximately correct statement is that the permanent wilting percentage is the lower limit of available water. Soils below the shallow surface layer which may be dried by direct evaporation seldom dry out much below this moisture content. The water between the field capacity and the permanent wilting percentage is readily available to plants, and in the experiments no evidence of water shortage has been detected until the moisture content of the soil is reduced close to the permanent wilting percentage.

The field capacity and the permanent wilting percentage may be considered characteristic of the soil and cannot be changed appreciably by the addition of organic matter or other fertilizers. High field capacity may cause a soil to be considered a good one from a moisture viewpoint, but actually it may be a poor soil because of a high permanent wilting percentage and small amount of readily available water. Soils with narrow ranges of readily available water may require frequent irrigations, especially with shallow-rooted crops, and consequently the waste involved in irrigating may materially increase the use of water.

Portable valve meter for measuring irrigation water, J. E. Christiansen. (Calif. Expt. Sta.). (*Agr. Engin., 19 (1938), No. 10, p. 428, figs. 3*).—A portable irrigation meter developed by the station for measuring irrigation water issuing from an alfalfa valve on a concrete pipe line is described.

Soil stabilization with emulsified asphalt, R. M. Morton (*Agr. Engin., 19 (1938), No. 11, pp. 475–477, figs. 4*).—The process of soil stabilization by mixing emulsified asphalt with clay-bearing soil or fine aggregate material to provide foundations for feed yards, barn floors, holding pens, and other farm structures is described.

Mixing requires the presence of sufficient water to wet and separate the fine clay particles of the soil or aggregate, thus permitting them to come into intimate contact with the asphalt in the emulsion. Mixing is followed by compacting and thorough drying of the mixture. Fifteen percent of emulsified asphalt, based only on the weight of the material which passes the No. 200 sieve, is the average required for efficient stabilization.

Farm gas engines and tractors, F. R. Jones (*New York and London: McGraw-Hill Book Co., 1938, 2. ed., pp. XII+486, figs. 479*).—The present edition condenses the two parts of the first edition (E. S. R., 67, p. 325) into one with the elimination of considerable duplication. New chapters on Diesel-engine construction and operation, fuels and their characteristics, and electric starting and lighting equipment have been written. The illustrations have been revised and brought up to date. The book is designed for the use of agricultural colleges and vocational work instructors and for the information also of mechanics, service men, etc.

Effect of tire wear on tractor performance, E. L. Barger and J. Roberts. (Kans. Expt. Sta.). (*Agr. Engin., 20 (1939), No. 5, pp. 191–194, figs. 11*).—Studies with two tractors at the station on the effect of wear of treads of rubber tires on tractor performance on several different types of traction surfaces and including performances of the operations of disking and plowing showed that the maximum draft obtained was less with worn tires on all traction surfaces. The drawbar load at which lowest fuel consumption was obtained was influenced by the condition of the tire tread. The range of

loads through which low fuel consumption can be obtained was wider with new tires. At light-to-medium drawbar loads the fuel consumption with worn tires was no greater than with new tires. Within the range of normal farm operation on field soils, the worn tires will still give good performance. It appears that the limitation in maximum draft with worn tires on a few traction surfaces will probably be the chief factor prompting the tractor operator to take some action when his tractor tires become worn.

An electrical drawbar dynamometer, H. L. Garver and F. A. Brooks. (Calif. Expt. Sta.). (*Agr. Engin., 19 (1938), No. 10, pp. 431, 432, figs. 4*).—A brief technical description is given of the design of a dynamometer utilizing electrical principles for indicating horsepower and integrating foot-pounds of work. This has been developed by the station for use in research on the development of power machinery.

Tillage in relation to weed root systems, E. A. Hardy (*Agr. Engin., 19 (1938), No. 10, pp. 435–438, figs. 12*).—A description is given of methods being developed by the University of Saskatchewan for the control by tillage of such weeds as quackgrass, wild oats, sowthistle, Canada thistle, poverty weed, leafy spurge, and bindweed.

The control measures which are followed where a crop is grown on the land every year are necessarily based upon efficient operation of such tillage implements as the plow, one-way disk, disk harrow, drag harrow, rod weeder, field cultivator, and various types of row-crop cultivators; also upon the timely application of the implements and the competition offered by the crop. The efficiency of the implement has been found dependent upon sharpness, scouring, and adjustment, as well as the design of the machine. Analysis of a great deal of tillage indicates that the efficiency of many of the common machines is only from 50 to 80 percent, even when sharp and in good adjustment. The failure in control of the perennial weeds has been largely due to poor quality work, sufficient top growth being missed to permit growth of the roots in spite of the tillage. Where the eradication of the weed is dependent upon complete and almost perfect cutting of all weed growth on the surface, the disks and cultivators have not proved satisfactory. The rod weeder was designed because of the incomplete work of the cultivator. The field cultivator is a valuable tillage implement to the farmer, if designed so that there is sufficient overlapping of the shovels to provide a complete cut, even when the shovels are partly dull, and also provide clearance for stubble. The moldboard plow has been altered by removing the moldboards and lengthening the shares to make a cultivator which produces a complete cut of all weeds in one operation, without pulverizing the soil excessively, and leaves the stubble on the surface as a trash cover to assist in preventing soil drifting.

Special sugar beet production machinery, S. W. McBirney. (U. S. D. A.). (*Agr. Engin., 19 (1938), No. 11, pp. 481, 482, 484, figs. 6*).—Machinery developed by the Bureau of Agricultural Engineering for large-scale sugar beet production as practiced on the Pacific coast is described.

Equipment for swine production, B. M. Anderson and V. R. Hillman (*Kansas Sta. Bul. 286 (1939), pp. 45, figs. 32*).—This is mainly a reprint of Bulletin 243 (E. S. R., 58, p. 781).

A portable hay drier, W. Aitkenhead. (Ind. Expt. Sta.). (*Agr. Engin., 20 (1939), No. 5, pp. 179, 180, figs. 3*).—A portable hay drier developed at the station is described. The efficiency of the drier, based on fuel supplied and water evaporated, is 44 percent. The cost for fuel per ton of dry hay when

working on hay with 58 percent moisture and drying down to 15 percent moisture is about $3.25 per ton of dry hay.

The ice well refrigerator, H. F. McColly (*North Dakota Sta. Cir. 65 (1939), pp. 11, figs. 5*).—The ice well as discussed in this circular consists of an insulated or lined pit in the ground in which ice is formed or placed during freezing weather, the pit proper being not less than 8 by 8 by 8 ft., covered either by a small frame building or by a watertight roof covered with straw and provided with a central opening having two trap doors connected so that the lower door is raised with the upper. In soil having inadequate underdrainage, a further essential feature is an additional 1 or 2 ft. of excavation depth with a corresponding depth of filling of coarse stones and gravel up to the bottom level of the pit proper. In wet locations or in very heavy soils, a drainage sump and provision for pumping may also be necessary.

For lining the pits designs with dimensions and cost data are given both for wood linings with air space and for a cobblestone concrete lining. The masonry pit is made 9 ft. square to offset the difference in insulating value between masonry and wood with air space.

As foundations for the building covering the pit, concrete (preferred) and lumber sill constructions are considered. The building design includes a trap door in the floor for entrance to the pit, dumb-waiter to be lowered onto the ice, louver ventilators or ceiling ventilator for escape of hot air during summer, flooring made up of removable panels to permit taking up the entire floor during freezing weather, etc.

Fully dimensioned drawings for ice wells built of lumber and for those built of cobblestone concrete and for a well with straw-covered roof instead of the (preferred) frame building are included, together with bills of materials. The drawings are so greatly reduced in size for printing, however, that some of the dimension figures are very difficultly legible.

Temperatures maintainable in ice-well refrigerators are discussed, and curves showing daily temperatures in an ice well at a distance of 1.5 ft. above the ice for the weeks beginning May 17, June 14, and October 4 illustrate a group of specific measurements. With respect to temperature maintenance, it was found that "after all the ice has melted in the pit, which in most cases will be sometime in September, the temperature in the pit slowly rises to about 45° to 50° F. maximum. This takes approximately 3 weeks, so it is possible to secure quite satisfactory cooling results with the ice well until about the middle of October or a little later."

Precooling tests of Indiana strawberries, cantaloupes, and peaches, T. E. Hienton and K. I. Fawcett (*Indiana Sta. Bul. 439 (1939), pp. 36, figs. 23*).—In these tests 22 carloads of strawberries, 25 of cantaloups, and 19 of peaches were included in the precooling tests in Indiana which have been continued since 1933. All of them were precooled with the exception of 1 carlot of strawberries, 2 of peaches, and 3 of cantaloups used as checks in transit tests. The rate of cooling was faster with 2 disk fans, of 18-in. diameter, 1,750 r. p. m., with 0.75-hp. motors, than with other fans used, but was approximately the same as that for 4 bunker blowers, and slightly less than that of a truck unit. Lack of sufficient ice in the bunkers was found to retard the rate of cooling where fans are used. The amount of ice used was 2,200 lb. for the precooling of a car of strawberries, 3,500 lb. for a car of cantaloups, and 6,100 lb. for a car of peaches, when some cooling had occurred prior to the start of precooling. The amount of salt added to the ice in the bunkers during precooling was found to affect directly the rate of cooling and inversely the time required for precooling. Four hundred lb. were used without freezing the fruit in the car. Precooling

the top layer of a carlot of strawberries to approximately 45° F. prevented the development of rot in transit and resulted in higher return to the shipper than for one not precooled. Precooling the top layer of a carload of cantaloups to 50° or below will enable the grower safely to market vine-ripe melons at a greater return than for those which are half-slip or less. The rate of precooling of peaches in ventilated baskets with ventilated liners and ventilated pads was greater than that in regular bushel baskets. Brown rot development in the top layer of a carlot of peaches is definitely inhibited during transit by precooling to less than 50° before shipment.

Stressed plywood coverings for poultry brooder houses, H. Giese and G. H. Dunkelberg. (Iowa Expt. Sta.). (*Agr. Engin., 20 (1939), No. 5, pp. 187–189, 194, figs. 8*).—Tests of three poultry brooder houses by the station indicate that a curved or gothic roof with 6-ft. clearance at the center makes a desirable shape for a brooder house, with a satisfactory work space for the attendant. A house 10 ft. wide by 12 ft. long proved more desirable than one 12 ft. wide and 10 ft. long. A plywood roof covered with dark-colored roll roofing absorbs heat from the sun's rays readily, and further insulation or ventilation would be necessary to keep inside temperatures low on warm sunny days. Glued plywood construction reduces air infiltration to a minimum. Plywood $\frac{3}{16}$ in. thick can be easily bent to the 5-ft. 6-in. radius used in these houses but requires headers at the ends of the sheets. Brooder houses of plywood over laminated bent glued rafters can be made light in weight and at the same time strong and rigid. Plywood gusset plates appear to be an effective means of fastening structural members.

Energy requirements and safety features of electric insect traps, J. R. Tavernetti and J. K. Ellsworth. (Calif. Expt. Sta.). (*Agr. Engin., 19 (1938), No. 11, pp. 485, 486, 490, figs. 6*).—Experiments with green bottle flies and potato tuber moths showed that there is a definite range of current, depending upon the voltage and space between bars of an insect trap, that will give a satisfactory kill of insects on an electrocuting grid. Because satisfactory kills were obtained with very small currents (less than 5 ma.) and because of the similarity of the current-voltage curves for a 75-percent kill and for break-down of the air gap between bars, there is an indication that the current and voltage are governed by that necessary to create an arc rather than that necessary to kill the insect.

In the practical use of electrocuting grids on insect traps, other factors besides killing the insects must be considered in determining the electrical requirements. The use of high voltage makes insulating more difficult and increases corona loss. In the laboratory the latter was both audible and visible in a dark room from the loose ends of the bars when the voltage exceeded about 5,000 v.

The use of neon lights (which is common where colored light is desirable) presents a problem in reducing the current. On traps where an ordinary mazda light is used to attract insects, the current and voltage on the grid are independent of the light. When neon lights are used, however, the light is operated in parallel with the grid from the high-tension transformer and the current in the light is the same as in the grid. Since the intensity of the light is an important factor in attracting the insects, reducing the current on the grid would also reduce the light intensity and cut down the number of insects which would be attracted.

Since it is essential that the grid be kept clear of dead insects, sufficient current and voltage should be available to burn or knock them off by arcing in case they stick on the grid.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics by the Ohio Station] (*Ohio Sta. Bimo. Buls. 199 (1939), pp. 131, 132; 200, pp. 142–144*).—The usual table of index numbers of production, prices, and income, by J. I. Falconer (E. S. R., 81, p. 589) is continued through April 1939 in No. 199 and July 1939 in No. 200. No. 199 includes a table by Falconer showing the estimated tonnages of different commercial mixed and unmixed feeds retailed in Ohio by years 1929–38, inclusive. No. 200 includes tables by G. F. Henning showing the indexes by years 1929–38 of trucking rates to Cleveland, Columbus, and Cincinnati for distances of less than 50 miles and 50 to 100 miles for cattle, calves, hogs, and sheep, and for all species of livestock.

Differences in Iowa farms and their significance in the planning of agricultural programs, W. W. Wilcox and N. V. Strand (*Iowa Sta. Res. Bul. 260 (1939), pp. 47, figs. 8*).—In this study, carried on in cooperation with the Iowa State Planning Board and the Works Progress Administration, an analysis is made of a sample of agricultural statistics gathered by assessors in the years 1928–33, inclusive, in the different type-of-farm areas of the State. Three groups of townships were selected in each area as representative of the most productive, the intermediate, and the least productive soils of the area. The relation of soil resources to use of cropland and corn yields, the variations in livestock systems, the relation of size of farm and tenure of operators to farm organization, yields, etc., the variations in farming on similar soils, and the implications of the differences in the planning of national adjustment programs are discussed.

The differences in the proportion of lands in crops on individual farms within a type-of-farming area were greater than the average differences between areas. Corn yields in the areas varied with productivity of soil to a less extent than is generally thought. Variations in livestock systems within the areas were related somewhat to cropping systems, but the differences in the proportion of various classes of livestock associated with different cropping systems were less than might be expected. Size of farm was a much larger factor in determining the kind and amount of livestock per 100 acres than in determining the type of cropping system followed. The proportion of cropland normally kept in hay varied more between owner- and tenant-operated farms than did the acreages in corn. In most of the areas the differences between owner-operated farms were greater than between tenant-operated farms. In each area corn yields on owner-operated farms were from 1 to 3 bu. per acre larger than on tenant-operated farms. Variations in cropping systems on similar soils were as great as those associated with different levels of productivity. In summing up the discussion of the implications of the differences in planning national adjustment programs the authors state that "in view of our limited inventory data, if the national program continues to have the two objectives—price maintenance through controlled production and conservation of the soil—ways and means must be found to permit the local committees to set up the detailed procedure for accomplishing the conservation goals. Local farmers are the only ones who have sufficient knowledge of their resources and how they are being used to be able to work out a procedure adapted to the variety of conditions encountered. (But they will probably need technical assistance.) Such a plan would increase administrative expenses. To offset this, however, less money would be paid to farmers for adjustments not desired or for legal compliance with the program even though no benefits to either the individual or the nation resulted." And further,

"studies of farm organization and management might be improved in many cases by putting more emphasis on adequate sampling of farms with similar resources rather than the sampling of geographic areas. Adjacent geographic location simply does not assure similarity of productive resources, which is so often assumed in these studies."

An economic study of land utilization in Chautauqua County, New York, A. Joss (*[New York] Cornell Sta. Bul. 720 (1939), pp. 51, figs. 22, map 1*).—This bulletin, which continues the series (E. S. R., 80, p. 838), describes the topography, climate, roads, and markets of the country, and the changes in the crop and livestock production since 1844. The land use, soils, numbers of cattle, real estate values, farm management factors, etc., in the five land-class areas are discussed. Programs are outlined for the extension of roads and rural electric and telephone lines.

The agricultural conservation program in New Hampshire, H. C. Woodworth, V. H. Smith, and E. Rauchenstein. (Coop. U. S. D. A.). (*New Hampshire Sta. Bul. 314 (1939), pp. 32, figs. 4*).—A survey including 1,900 farms in 12 towns was made of the acreage in crops, numbers of each class of livestock, farm practices, participation in agricultural conservation programs, etc., in the years 1935, 1936, and 1937, the reactions of farmers to the program, and farmers' suggestions for improvement of the program. In the analysis the farms were divided into five groups, commercial—active and inactive, and noncommercial—subsistence, residence, and miscellaneous, and the enrollment and participation in the program, present management of tillage land, and the effects of conservation programs on dairy production, cow population, and fruit and vegetable farms are discussed.

The enrollment in the conservation program increased from 342 operators, representing 34 percent of the land in farms, 36 percent of tillage land, 51 percent of the cows, 21 percent of the hens, 31 percent of orchard acres, and 47 percent of the vegetable acreage in 1936, to 664 operators, representing 59 percent of the tillage land, 78 percent of the cows, 48 percent of the hens, and 76 percent of the orchard and vegetable acreage, respectively, in 1937. The enrollment in 1937 included 84.4 percent of the active and 52.9 percent of the less active commercial farms, 33.9 percent of the subsistence farms, 8.3 percent of the residence farms, and 17.1 percent of the miscellaneous farms. Of the enrolled farms 91.3 percent of the active and 79.7 percent of the less active commercial, and 61.2 percent of the subsistence and 28 percent of the residence farms qualified for payments.

Farm management research and agricultural adjustment in the Southwest, C. A. Bonnen. (Tex. Expt. Sta.). (*Southwest. Social Sci. Quart., 19 (1938), No. 1, pp. 76–86*).—The evolution of the research program in farm management in Texas is described, particular attention being given to modifications traceable, in part at least, to agricultural adjustment programs. A plan for the advancement of both research and extension programs in farm management and for the establishment of a sound basis for the administration of agricultural adjustment programs is outlined.

Plantation organization and operation in the Yazoo-Mississippi Delta area, E. L. Langsford and B. H. Thibodeaux. (Coop. Miss. Expt. Sta.). (*U. S. Dept. Agr., Tech. Bul. 682 (1939), pp. 92, figs. 24*).—"It is undertaken, in this bulletin, to describe the situation as to the organization, operation, and earnings of representative plantations in the area during the 5-yr. period 1932–36, and to account for the major causes of differences in plantation earnings during that period; to examine certain aspects of the tenancy and labor situation on plantations; to present information on the labor, power, materials, and other items used

in connection with different production methods; and lastly, to analyze the relative economic advantages of various adapted systems of plantation organization in the area." The major emphasis is placed on the economic aspects, with only incidental consideration to sociological factors. The bulletin is based on data collected during the years 1932–36, inclusive, from an average of 24 plantations. The data on financial aspects were obtained directly from plantation accounts. Supplemental information as to land and livestock organization, crop yields, crop-production practices, livestock feeding, power costs, labor perquisites and supervision, etc., were obtained from the plantation operators or managers by periodical visits.

Types of farming in Tennessee, B. H. LUEBKE, S. W. ATKINS, C. E. ALLRED, and W. J. ROTH. (Coop. U. S. D. A.). (*Tennessee Sta. Bul. 169 (1939), pp. 94, figs. 49*).—The factors affecting types of farming, major land uses, crop and livestock distribution and trends, and types of farming and their location in the State are described. The State is divided into 15 types-of-farming areas with subareas and each described.

Farming systems and practices and their relationship to soil conservation and farm income in the wheat region of Washington, B. H. PUBOLS, A. E. ORR, and C. P. HEISIG. (Coop. U. S. D. A.). (*Washington Sta. Bul. 374 (1939), pp. 41, figs. 2*).—This study was made to determine the status of the soil, the seriousness of soil erosion, present land-use patterns, and present farming systems and practices, and provide data for suggestions for changes in farming systems and practices to promote soil conservation and to provide the agricultural population of the region with the maximum long-time farm income. It is based largely on field surveys in seven sample areas representative of the wheat region, on farm management studies covering 225 farms in the area, and on data on land utilization in 1935 and 1936 and income and expenses for the crop year ended June 30, 1936. The physical characteristics and land uses in the sample areas are described. In the analysis four slope and five erosion groups are used. The soil conservation practices in use or recommended are discussed.

The percentages of the land in the four slope groups and of the land in each group having 25 percent or more of the topsoil eroded and in nonsoil-depleting use were: Slope 0–5 percent, 6, 45, and 45 percent; slope 5–15 percent, 79, 95, and 6 percent; slope 15–30 percent, 11, 98, and 9 percent; and slope 30 percent and over, 4, 55, and 84 percent. Ninety-one percent of the soil was classified in soil erosion groups with 25 percent or more of the topsoil removed by sheet and wind erosion. Full owners operated 18 percent, part owners 53 percent, and tenants 29 percent of the land in the sample areas. In general, part owners operated the largest and full owners the smallest farms. Net cash income in the different sample areas varied from $0 to $1,625 for very small farms (such farms reported in only one area), $752 to $2,804 for small farms, $1,445 to $5,055 for medium farms, and $2,376 to $13,978 for large farms.

In summing up the readjustments needed the authors state that "once a new equilibrium is established, there will be among other things, less land in tilled crops, less wheat, more forage crops, an increase in livestock, a shift of low yielding wheat land to range land, new ranch units, an increase in the size of the small wheat farms in the dry sections, and a possible decrease in the size of the extremely large farms in the humid sections. All of these changes should operate to conserve the soil and to improve the welfare of the farmers of the wheat region."

An economic study of 270 tobacco farms in Puerto Rico, 1936–37 [trans. title], R. COLON TORRES (*Puerto Rico Col. Sta. Bul. 50 (1939), Span. ed., pp. [3]+54, figs. 10; Eng. abs., pp. 51–54*).—The data were obtained by the

survey method on 270 farms located in the tobacco area, of which 7 percent were rented and 14 percent part-owned, while on 112 all or part of the tobacco was planted by sharecroppers. The farms averaged 63 cuerdas (61.1 acres), of which 36 cuerdas were cropped during the year, 9.9 being in tobacco. The average value of livestock was nearly $400 per farm. Crop sales constituted 78 percent of the total receipts (tobacco 59 percent). Livestock and livestock products contributed $156 per farm, increase in inventory $118, and miscellaneous receipts, mostly soil conservation payments, $72. Average total expenses per farm were $1,364, of which $740 was for labor and $231 for fertilizers and insecticides. Operator's labor income, including farm privileges valued at $315, averaged $202 per farm. The return on capital was —3.7 percent. Farm earnings in this year of unfavorable weather and low tobacco prices showed an inverse relationship to area in tobacco. The labor income averaged $1,290 greater on the 50 farms with the highest income than on the 50 farms with the lowest income. This higher income was due to 25 percent better yields, 8 percent higher prices for tobacco, better diversification of sources of income, especially more livestock, higher production per animal unit, lower operating expenses, and better labor efficiency.

Apple orchards: Cost of developing, values, and financial returns, G. P. Scoville (*[New York] Cornell Sta. Bul. 717 (1939), pp. 44, figs. 6*).—The growing, harvesting and marketing costs, and profits 1909–21, and the profits 1922–37 from a 10-acre apple orchard interplanted with peaches in western New York, the costs, labor and horse work, etc., 1917–26 on a 10-acre apple orchard in the Finger Lakes region set in a former wood lot, and the costs in a Champlain Valley orchard of 105 acres set from 1930–34 are analyzed and discussed. Based on these and other studies, the importance of soil in the production of apples, orchard values and the changes in such values, and the farm value and financial returns from orchards in the Champlain and Hudson Valleys, the Morton and Hilton areas, and Niagara County are discussed.

Farm credit in Marshall County, Tennessee, 1938, C. E. Allred, B. H. Luebke, and R. G. Milk (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 94 (1939), pp. [1]+IV+46, figs. 33*).—This analyzes and discusses the types, sources, costs, and uses of credit in the county. It is based on data obtained from 100 farmers, 7 lending agencies, and 12 merchants.

Texas farm tenure activities, C. H. Hamilton. (Tex. Expt. Sta.). (*Jour. Land and Pub. Util. Econ., 14 (1938), No. 3, pp. 330–333*).—This article discusses the character and trends of farm tenancy in Texas, and the study being made of the problem by the Texas Experiment Station. It also gives some findings as to the income of the landlords and tenants in an analysis of approximately 600 farm records for farms in the 4 major type-of-farming areas of the State. Some of the findings in this analysis were: Tenants pay about one-third of the net cash receipts and about one-fourth of the net farm income as rent; although net income is highly correlated with size of farm and productivity of the land, there is no apparent relation between these factors and the percentage of net income paid as rent; and about one-fourth to one-third of the gross income on purely share-rented farms may be classified as nonshared income, being mainly tenant farm living from the farm and sales of livestock and livestock products, a cash item.

Cotton prices in spot and futures markets, L. D. Howell (*U. S. Dept. Agr., Tech. Bul. 685 (1939), pp. 72, figs. 33*).—This bulletin, which replaces Department Bulletin 1444 (E. S. R., 56, p. 586), presents information on the supply, movement, uses, mill consumption, growths and qualities of cotton consumed

in the United States, supply-demand price relationships, local, central, spinners', and futures markets, and the protective features of trading in futures.

An economic study of fruit and vegetable wholesaling and jobbing firms in New York City, T. N. Gearreald ([*New York*] *Cornell Sta. Bul. 721* (*1939*), *pp. 67, figs. 12*).—This study was made to obtain data that would assist in bringing about a better understanding of the financial operations of wholesalers and jobbers of fresh fruits and vegetables, and would make possible the setting up of standards of comparison between individual businesses. The data were taken directly from the financial reports for 1935 of 29 wholesale receivers of fruits and vegetables on the lower westside Manhattan market, 9 wholesale receivers of the less perishable commodities, such as potatoes, onions, turnips, late cabbage, and bulk apples, and 15 jobbing firms located in the Bronx Terminal market and the Wallabout market in Brooklyn. The three types of businesses are described and the representativeness of the firms studied discussed. For each type of business the balance sheets, returns and allowances, cost of sales, and the operating expenses are analyzed and discussed and comparisons made with findings in a previous study in 1924 (E. S. R., 62, p. 680). The relationships for each of the three types of business of sales to prices, earnings, operating expenses, gross margins, etc., are also analyzed and discussed.

For the 29 wholesale fruit and vegetable firms 93.5 percent of the sales was paid for products. Of the 6.5 percent gross margin 5.8 percent was used for operating expenses and 0.9 for salaries of principals, leaving a net loss of —0.2 percent. Of the total operating expenses wages of employees constituted over 37 percent, salaries of principals about 13 percent, and brokerage and commissions 7 percent. The 9 wholesale firms handling the less perishable products had a gross margin of 9.2 percent of the sales, consisting of 7.6 percent for operating expenses, 1 percent for salaries of principals, and 0.6 percent net profit. Labor and management accounted for about 50 percent of the operating expenses and containers for over 15 percent. The 15 jobbing firms took a gross margin equal to slightly over 10 percent of the sales. This consisted of 8.6 percent for operating expenses, 2.1 percent for salaries of principals, and a net loss of —0.3 percent. Wages amounted to 42 percent and salaries of principals to 20 percent of the total operating expenses. For the wholesale firms on the lower westside Manhattan market during 1926–35, volume of sales in dollars per firm followed the same trend as farm prices of fruits and truck crops, and there was a relationship to farm prices and wholesale prices of all commodities. The price of potatoes was the most important factor in determining the volume of sales of the 9 firms handling the less perishable commodities. Variations in actual earnings for the 29 firms correspond closely to the variations in fruit prices and for the 9 firms to potato prices. In all three types of businesses studied, operating expenses per $1,000 of sales decreased with increased sales, capital investment per firm increased, and gross margin decreased. No definite relation was found between sales and net profits or actual earnings.

Relation of market quality to the price received for Long Island cauliflower, J. D. Hartman ([*New York*] *Cornell Sta. Bul. 716* (*1939*), *pp. 36, figs. 14*).—Records regarding 13 characteristics of cauliflower were made at the time of sale on the auction of the Long Island Cauliflower Association on about 1,500 lots each in 1934 and 1935, including 90,000 and 85,000 crates in the respective years. Many characteristics were also recorded for 360 loads carrying 13,000 crates in 1933. All prices of lots on which records were taken during a certain period of one day were expressed as percentages of the average

prices of all lots of No. 1 cauliflower sold during the same period. All lots were classified according to all characteristics recorded for them. The data were analyzed by the subsorting or cross-classification method, the percentage prices being cross-classified according to their recorded characteristics. The method is described and discussed in an appendix. An analysis also was made of prices received for lots labeled No. 1, No. 2, or field run by the growers, and of the prices for lots purchased by fertilizer companies, as such purchases are partly for the purpose of collecting bills owed to the companies.

Some of the findings as to the effects of different characteristics on prices received were: Larger lots brought much higher prices. Crates with a relatively small number of large heads brought much higher prices than those with a larger number of small heads. The more the curds were covered by surrounding leaves the higher the prices. Full crates brought definitely higher prices than loosely packed crates. Darkly discolored heads and heads with many diseased or yellow leaves reduced prices markedly in 1934. Light discoloration and moderate riciness in some heads reduced prices, but these defects are not considered serious. In 1935 lots labeled No. 1 grade brought on an average 39 percent more than equally good lots labeled No. 2. "The premiums paid for high quality were apparently for careful and judicious growing, harvesting, and packing, rather than for grading." Lots sold to fertilizer dealers brought 7.4±1 percent more in 1934 and 5.8±0.5 percent in 1935 than those not sold to dealers.

Markets and market preferences for Idaho potatoes, O. L. Mimms and G. W. Woodbury (*Idaho Sta. Bul. 231 (1939), pp. 18, figs. 4*).—The development of the potato industry in Idaho, and the place of potatoes in the agriculture of the State are described. Factors affecting quality—varieties, soils and climate, cultural, harvesting, and handling practices, and storage and grading; the markets, market preferences, and price premiums for Idaho potatoes; the demand for such potatoes by consumers, retail stores, and eating places; and containers used in shipping Idaho potatoes are discussed. The value of the outlook reports of the U. S. Department of Agriculture and State extension services to potato growers of the State is also discussed.

Post-war developments in the marketing of cheese, W. H. Nicholls (*Iowa Sta. Res. Bul. 261 (1939), pp. 49–148, figs. 6*).—This study is similar to that of the developments in butter marketing during the same period (E. S. R., 81, p. 437). It traces the concentration in the cheese industry since the World War, the changes it has brought about in marketing channels, and the primary forces responsible for the developments. The various business units are described under their actual identity rather than by classification, such as processed cheese manufacturers, meat packers, and cooperative sales agencies. The material is presented in sections on the marketing picture of 1918–20, developments of 1921–26, patents, merger, and consolidation 1927–30, and cheese marketing and the great depression 1931–38. An economic appraisal of the developments and a theoretical comparison between cheese prices to farmers when there is pure competition in the industry and when there is pure monopoly or oligopoly, with particular emphasis on the results when there has been a considerable increase in demand, are also included. Appendixes include a description of the important patents on cheese held by different companies, and the methods used in calculating relative importance of different channels of distribution.

In 1918 the four largest meat packers handled 48.5 percent of the nation's cheese, practically all of which moved direct to retail channels, while about 50 percent probably was still moved through independent terminal wholesalers and

wholesale groceries to retailers. The period 1921–26 saw the beginning of the rise of processed cheese to importance. The rapid growth of chain store organizations helped to narrow the margin between wholesale and retail prices through direct purchasing in the producing area and diverted large amounts of milk cheese, but the development of this type of integration was probably limited from proceeding to the extent it would have if processed cheese had not developed. The number of wholesale houses was reduced, as while processed cheese still moved to an important extent through wholesale channels, the development of a standardized branded product decreased the need for the wholesalers' once vital functions of grading, standardization, and reselection. During the period 1927–30 the problem of patents came to a head and resulted in widespread combination and concentration of distribution. By 1930 all the basic patents were in the hands of the two largest dairy companies of the country. By 1929 14 percent of all Cheddar cheese reached the consumer in processed form. The production of processed cheese expanded from an equivalent of 13.9 percent of the American Cheddar cheese production in 1929 to 40.5 percent in 1931, and over 50 percent in 1937. In 1934–35 about two-thirds of the domestic cheese production moved through integrated channels from dairy corporation or meat packer direct to the retailer or large user, nearly 5 percent from local factory to the consumer either direct or through the manufacturer's retail stores, only 14 percent through old-line wholesale channels, and only 2 percent all the way from local factory to the consumer through independent agencies.

"At the present time the cheese industry is becoming restive, since some of the basic patents have expired. The large distributors, however, still hold patents on later processing equipment which gives them great technical advantages over competitors. The enormous good will they have built up for their products through extensive differentiation in packaging and advertising is also likely to be an important barrier to the growth of other processors, even though the latter can now legally enter the field. The most important potential development is probably the entry of the chain stores into the cheese processing field, especially if the large distributors continue to insist too much upon dictating resale prices."

Death and crippling in livestock marketing, A. A. Dowell and R. J. Eggert (*Minnesota Sta. Bul. 342* (*1939*), *pp. 40, figs. 5*).—Data were obtained from the St. Paul Union Stock Yards Company showing receipts by truck and by rail by species of livestock for the period 1910 through 1937; the losses by death and crippling by types of transportation up to the time of unloading for the years 1928–37, inclusive; receipts for a full week each month 1936 and 1937 by truck and rail from each county in Minnesota and each State of origin; numbers of each species of livestock dead or crippled upon arrival by truck or rail; and numbers that died between unloading and weighing by month 1936–37, and for a full week each month for the shipments from Minnesota counties and other States. Data were also obtained from packers as to the number crippled each month 1936–37 between unloading and time of weighing.

The percentages of total receipts arriving by truck or wagon increased from 8 for cattle, 2.5 for calves, 1.6 for hogs, and 0.4 for sheep in 1920 to 8.1, 17.3, 1.4, and 8.1 percent, respectively, in 1927, and 57.1, 80.4, 83.2, and 41.5, respectively, in 1937. Of the receipts of different species in 1937 approximately 54 percent for cattle, 73 percent for calves, 88 percent for hogs, and 50 percent for sheep came from Minnesota. Of the Minnesota livestock about two-thirds of the cattle came from 125 miles or less and one-half from 100 miles or less. Two-thirds of the hogs came from within a radius of 100 miles and one-half of the sheep from within 125 miles.

Death losses per 1,000 head up to the time of unloading and during unloading in 1928 and 1937, respectively, were: Cattle, by truck 0.34 and 0.62, by rail 0.31 and 0.29; calves, by truck 0.72 and 1.69, by rail 3.56 and 2.54; hogs, by truck 0.71 and 1.03, by rail 1.11 and 0.88; and sheep and lambs, by truck 0.25 and 3.56, by rail 1.97 and 1.06. The crippled losses were: Cattle, by truck 2.3 and 1.39, by rail 0.9 and 0.32; calves, by truck 0.29 and 0.63, by rail 0.95 and 1.73; hogs, by truck 0.94 and 2.74, by rail 2.51 and 3.79; and sheep and lambs, by truck 0.11 and 0.82, by rail 0.73 and 0.48.

In 1936 and 1937 death losses of cattle (combined rail and truck shipments) up to unloading were about twice as high in the winter as in the summer. Crippling losses were highest for rail shipments in the fall and early winter and for truck shipments in late winter, spring, and late summer. The percentage of cattle crippled after unloading was higher in April and May. There was little seasonal variation in death losses of calves up to unloading in rail shipments. In the case of truck shipments the losses were heaviest in the winter and early spring. Losses after unloading were highest in the winter and the summer. There was little seasonal variation in crippling up to the time of unloading, but after unloading the losses were considerably higher in the late fall and winter. Death losses of hogs up to unloading in rail shipments were highest in July, with a secondary peak in December. Truck shipments followed the same general trend, with a less pronounced rise in the summer. Crippling in both rail and truck shipments up to unloading was highest in the late fall and winter, with the peak in February. After unloading death losses were highest in the summer. Crippling losses were highest in the late winter and lowest in October. Death losses of sheep and lambs before unloading were highest in the spring and lowest in the summer. There was little seasonal variation after unloading. Crippling losses were most prevalent from December through April, and lowest from July through September. After unloading the highest losses were during the first half of the year. Death and crippling losses up to unloading for Minnesota shipments showed no consistent relationship to distance shipped, due probably to the class, type, age, and condition of the livestock shipped from different districts.

Cold storage locker plants, M. A. Schaars (*Wisconsin Sta. Spec. Bul., 1939, Apr., pp. [2]+22, fig. 1*).—This bulletin is based on interviews with operators and users and correspondence with operators throughout the United States. It describes the types of plants, layout of complete or multiple service plants, construction features, cost of construction, cost of operations, charges, income and profits, ownership of plants, licensing, operating policies, and regulations, size and location of plants, products stored, advantages from a farmer's standpoint, and the possible use by and advantages to city consumers.

Foreign Agriculture, [August 1939] (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Foreign Agr., 3 (1939), No. 8, pp. 319–372, fig. 1*).—Included are articles on Agricultural Problems of India, by W. Ladejinsky (pp. 321–346), and Agricultural Price-Supporting Measures in Ireland, by C. C. Taylor (pp. 347–370), and notes on recent developments in foreign agricultural policy as follows: New Zealand to control price increases and Italy establishes foreign-trade monopoly in poultry and eggs.

International yearbook of agricultural legislation, 1938 [trans. title] (*Inst. Internatl. Agr. [Roma], Ann. Internatl. Lég. Agr., 28 (1938), pp. XLIII+1078*).—This volume continues the series (E. S. R., 80, p. 410).

International yearbook of agricultural statistics, 1938–39 (*Internatl. Inst. Agr. [Roma], Internatl. Yearbook Agr. Statis., 1938–39, pp. XXXVI+1038*).—This volume continues the series (E. S. R., 80, p. 129). So far as possible world

totals of production are calculated to include the year 1938 for the northern and the first months of 1939 for the southern hemisphere, and exports and imports for 1938.

RURAL SOCIOLOGY

Adjusting agriculture and services to the needs of farm people, C. O. BRANNEN. (Univ. Ark.). (*Southwest. Social Sci. Quart., 20 (1939), No. 1, pp. 1-11*).—The author attributes our progress as a nation to our natural wealth, ingenuity of American industry, and to the balance of population elements, particularly to the stabilizing influence of the farm population.

Problems in plant, animal, and human nutrition as related to the social and economic life of the South, H. P. COOPER. (Clemson Agr. Col.). (*Assoc. South. Agr. Workers Proc., 40 (1939), pp. 3-8*).—The author discusses the readjustments essential to the permanency of civilization in the South.

The drought farmer adjusts to the West, R. WAKEFIELD and P. H. LANDIS (*Washington Sta. Bul. 378 (1939), pp. 56, figs. 9*).—This study evaluates briefly the characteristics and conditioning factors in the background of the drought migrants who are settling in rural areas of the State of Washington and points out the problems and difficulties involved in this settlement. It is an intimate account of the adjustments of 381 families entering the State between January 1, 1932, and August 20, 1938, chiefly from the "drought States" and 70 percent resident on farms in 8 widely scattered rural areas when interviewed.

"The migrating group located in the Pacific Northwest contains a great number of children. Most of them are from the northern Great Plains States where educational levels and standards of living have been high, where, until relatively recent times, thrift, independence, self-reliance, and individualism of a constructive sort have been prominent. If ways can be devised for integrating the new group into the economic and social scheme of the West, they will become the sturdy, self-reliant citizens of tomorrow. Given no effective place in the present social scheme, they are most likely to join the migratory farm laborers who wander from crop to crop in quest of subsistence or live as settled farm laborers, working less than half of the year. In either case they very rapidly fall to a level of living which brings family degeneration and dependency."

Young men from Michigan farms: A study of farm-reared men who attended certain Michigan high schools which maintain departments of vocational agriculture, G. P. DEYOE (*Mich. State Bd. Control Vocat. Ed. Bul. 256 (1939), pp. 56, figs. 3*).—The author discusses occupational distribution, farming status, and certain educational attainments and associated factors.

"Data presented in this study indicate that of the farm-reared young men who have taken vocational agriculture in certain Michigan high schools, upward of three-fourths farm for at least a short period after leaving high school. For those out of high school for several years, about 50 percent are engaged in farming; but of these, decreased proportions are farming as laborers and increased proportions as owners."

Rural youth in North Carolina: A study of three selected areas, R. M. WILLIAMS (*North Carolina Sta. Bul. 324 (1939), pp. 63, figs. 13*).—This report is based upon data collected in personal interviews with 731 households in open country areas of Guilford, Union, and Wilson Counties. In each county a township was taken as the unit area for the study. Within each of these areas schedules were taken from 227 to 250 families having some members (either in the household or migrant from it) between the ages of 15 and 29, inclusive. A complete schedule was taken from each individual from 15 to 24 yr. of age, and a shorter schedule was used for persons from 25 to 29. In addition to these, a

family schedule was used to gather information as to household composition and socioeconomic status.

It is pointed out that North Carolina ranks second among the States in the ratio of youths to adults, and that the rate of decline has been less than in the country as a whole. There is a decided inverse relationship between the size of community and the ratio of youths to adults. The majority of the youths of this study have been reared in households of normal social and biological composition. The families are relatively large. The educational attainment of youths averages about two school grades higher than that of adult household heads. Marriages among youths take place at an early age; girls marry 2 yr. younger than boys. About one-half of all white youths are still in the prevocational stages of student or unpaid family laborer. Of the boys who are gainfully employed, about one-third are in nonfarm occupations. Curtailment of industrial opportunities results in a larger proportion of unpaid family laborers in the farm population. The data indicate a gap between school and the finding of a life work on the part of young people.

Mean annual cash incomes were for white boys $177, white girls $84, colored boys $72, and colored girls $32. Incomes of youths in nonfarming households usually exceed those of youths in farm households. Cropper and farm laborer youths have lower incomes than owner and tenant youths. Youths from 25 to 29 yr. of age have considerably higher incomes than those from 15 to 24. The crucial youth problem appears to be in the years from about 18 through 24. Migration of rural youths from farms to towns and cities tends to absorb the surplus of youths in rural areas. Mean age at migration is 21 yr. for boys and 20 yr. for girls. Rural-urban migration is selective of the better educated individuals among farm youths. This selection takes place in practically all sex, color, and age groups.

As to social participations, girls are more active than boys in organizations, white youths more active than colored, and single persons than married. The data point to the lack of organizations to fit the specific needs of young adults of the out-of-school group. In general, the higher the socioeconomic status of the household the larger the proportion of youths belonging to organizations, the more frequent the participation, and the greater the proportion of leaders among youths. The church ranks first as a source of formal social contacts among rural youths and the school ranks second. The proportion of all contacts supplied by the church is largest among the lower tenure groups in the farm population. A sampling of informal social activities in the Wilson County area indicated that boys are more fully emancipated from the home than are girls and have a larger proportion of urban contacts. Marriage results in a turning inward of social participations from the town and the farm community to the family group. Nonowner youths are more closely confined to the neighborhood and to the family group than are youths from households of farm owners.

Studies of suburbanization in Connecticut.—III, Wilton: A rural town near metropolitan New York, N. L. Whetten (*[Connecticut] Storrs Sta. Bul. 230 (1939), pp. 132, pl. 1, figs. 19*).—This is the third of a series previously noted (E. S. R., 80, p. 554) dealing with suburbanization in Connecticut. It describes the migration of families into rural towns in the vicinity of the larger cities and is designed to ascertain the social and economic adjustments resulting from this shift in population. It deals specifically with the town of Wilton, located in the southwestern part of the State near the New York State boundary. The topics discussed are composition of the population, migration, occupational activities, commutation and place of work, farming activities, residential and educational adjustments, and voluntary social organizations in Wilton.

Rural social areas in Missouri, C. E. Lively and C. L. Gregory (*Missouri Sta. Res. Bul. 305 (1939), pp. 39, fig. 1*).—The authors set up and describe 6 major areas which are subdivided into 16 units. A number of tables and a discussion of method are appended.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Achievement tests in relation to teaching objectives in general college botany, C. W. Horton (*Bot. Soc. Amer. Bul. 120 (1939), pp. 71*).—This study was sponsored and published by the Committee on the Teaching of Botany in American Colleges and Universities.

Farm management, R. R. Hudelson (*New York: Macmillan Co., 1939, pp. X+396, [figs. 29]*).—This high-school text and reference book deals with the subject from the point of view of the individual farm operator in sections on organizing the farm business, operating the farm business, and farm finance and farm accounts, with an introductory chapter on what farm management includes. The several chapters include selected references and questions and exercises.

Vocational training for older rural youth, A. M. Boynton and E. L. Kirkpatrick (*Washington, D. C.: Amer. Youth Comn., 1938, pp. [3]+60*).—This publication deals with the program being offered to older rural youth under the direction of the vocational education division of the U. S. Department of the Interior. For the agricultural phase the objectives, type of work included and persons served by part-time programs, examples of different types of programs, cooperation with the National Youth Administration, and further needs and possibilities are discussed. For the home economics phase the objectives and the extent of the program, types of programs, special cooperative endeavors, further needs and opportunities, and advantages of further coordination of the agricultural and home economics programs are discussed.

FOODS—HUMAN NUTRITION

The effect of various temperatures and time periods on the percentage of gelatination of wheat and cornstarch and of cereals containing those starches, O. Hughes, E. Green, and L. Campbell. (Ohio State Univ.). (*Cereal Chem., 15 (1938), No. 6, pp. 795–800*).—The data presented indicate high gelatination percentages for cornstarch and wheat starch and for a granular wheat cereal made from the endosperm. The higher the temperature used the shorter the period of heating required to obtain a high percentage of gelatination. Thus, both corn and wheat starches in concentrations of 5 percent are 100 percent gelatinized by boiling for 1 or 2 min., but only 95 percent gelatination is attained after 5 min. at a temperature of 95° C. At a temperature as low as 85° the corn and wheat starches, respectively, are only 70 and 60 percent gelatinized even after 15 min. Granular cereals do not gelatinize as rapidly as the corresponding starches, although the process is hastened if the cereal is first boiled for 1 or 2 min. and then heated over the water bath at 95°. By this method, which is comparable to the household practice of adding cereal to boiling water and finishing the cooking in a double boiler, 95 percent gelatination of the starch in granular wheat endosperm is attained in 10 min. Apparently long cooking periods are not necessary for starches and granular cereals.

A practical method of obtaining permanent records of baking studies, W. H. Cathcart (*Cereal Chem., 15 (1938), No. 6, pp. 775–787, figs. 12*).—By this method, bright well-diffused light is permitted to pass through a slice of bread,

The light which passes through is focused by means of a lens, and the image is caught on photographic projection paper. The apparatus for producing these focused projection pictures is illustrated and described in some detail, and a number of pictures are presented. By this method the defects of the bread are magnified and detail below the actual surface is brought out. It is believed to show all the important characteristics of grain and texture, and in this respect it is superior to camera photography. In addition it is cheaper and more rapid and a negative is not required. The method is applicable to experimental or commercial loaves of white bread, but does not give satisfactory results with dark bread. Pictures of pound cake are fairly satisfactory if the slices are $\frac{1}{16}$ in. or less in thickness. An apparatus similar to that described is on the market.

"Photo-records" as applied to cake, W. H. Cathcart (*Cereal Chem., 16 (1939), No. 3, pp. 423–429, figs. 6*).—Certain adaptations of the photo-record apparatus noted above, particularly with reference to the light source and the photographic paper, make it possible to obtain satisfactory photo-records of light (white and yellow) cakes. For good pictures, however, the slices must be thin. The method cannot be successfully applied to dark cakes.

Temperatures attained in baking products, R. A. Barackman and R. N. Bell (*Cereal Chem., 15 (1938), No. 6, pp. 841–845, fig. 1*).—Internal temperatures secured by thermocouple are reported for pancakes, waffles, biscuits, muffins, cake, and bread during baking. The temperatures attained are plotted against time in minutes, and the results are discussed briefly. The temperature attained in most doughs during baking is approximately that of boiling water. Biscuits, bread, cake, and other baked products with a soft spongy crumb do not attain temperatures over that of boiling water, but waffles, wafers, crackers, and other crisp, brittle, short-baked products attain greater internal temperatures.

The effect, on tenderness of meat, of differences in time of cooking produced by oven temperatures and by other means, S. Cover. (Tex. Expt. Sta.). (*Jour. Home Econ., 30 (1938), No. 8, p. 586*).—In this progress report on factors affecting the tenderness of meat on roasting (E. S. R., 77, p. 880), it is noted that highly significant differences in tenderness have been produced in paired roasts by using oven temperatures of 80° and 125° C. The roasts cooked at the lower temperature were much more tender than those at the higher temperature, but required approximately 24 hr. in total cooking time or from 15 to 20 hr. longer than the roasts cooked at the higher temperature. In paired roasts cooked at 125° in an ordinary gas oven and in a special oven where the humidity was very high and the air flow very low, the roasts cooked faster in the special oven than in the ordinary oven but were significantly less tender. These results are thought to emphasize the importance of slow cooking in producing tender roasts either in the oven or by other means. It is noted that the conditions in the special oven were similar to those occurring when a roast is cooked on top of the stove in a heavy covered pot without water.

Lengthening the cucumber season, J. Whitacre, S. H. Yarnell, and L. R. Hawthorn. (Tex. Expt. Sta.). (*Jour. Home Econ., 30 (1938), No. 8, p. 586*).—This study is noted in abstract. Three methods for storing cucumbers in a refrigerator at 35°–40° F. were studied for their effect on marketability and edibility. The cucumbers were (1) wrapped individually in moisture-proof cellophane, (2) placed unwrapped in a humidifier, and (3) packed unwrapped in various shipping containers lined with moisture-proof cellophane. All of the cucumbers showed no quality changes in 8 days and most of them were quite acceptable, though not in choice condition, after 2 weeks. The marketability on

the basis of weight, color, and turgidity was preserved longer than eating qualities on the basis of desirable texture, flavor, and palatability. Storage appeared to have no effect on bitterness. In tests repeated during three seasons, losses of weight during the 14-day storage period ranged from 1.5 to 3.8 percent for the individually wrapped cucumbers, approximately 3 percent for those stored unwrapped in a humidifier, and scarcely 2 percent for those storred in lined shipping containers. Check lots stored on an open shelf in the laboratory showed losses of from 10 to 15 percent for the unwrapped cucumbers and approximately 5 percent for those individually wrapped.

The culinary quality of apples as determined by the use of New York State varieties, M. C. Pfund (*[New York] Cornell Sta. Mem. 225 (1939), pp. 73, figs. 7*).—This investigation covered a period of 5 yr. during which 13 important varieties of New York State apples were tested periodically and 15 other varieties occasionally for their culinary properties when baked and made into applesauce. The apples were tested raw for firmness with the Magness and Taylor fruit pressure tester (E. S. R., 54, p. 39) and for acidity in terms of total titratable acidity and hydrogen-ion concentration. The cooking methods selected as most satisfactory for retention of flavor were as follows: For baking, cored apples in the proportion of 1 lb. of apples to 5 level teaspoons of sugar were placed in a covered baking dish and cooked in the oven at a temperature of 400° F. until nearly tender; they were then removed, and the cooking process was completed outside the oven in the hot covered dish. For applesauce, peeled and cored apples in the proportion of 1½ lb. of apples to hot sirup made of ⅛ cup of sugar and ¾ cup of water were placed in a covered pan and were cooked in the shortest possible time. The cooked apples were tested for acidity by H-ion concentration determinations with a quinhydrone electrode. Doneness in the baked apple was tested by a penetrometer and in the applesauce by piercing the pieces with the point of a paring knife. The applesauce was tested for consistency by a specially devised line-spread test. Personal opinion ratings by a judging committee of three or four were made of flavor, texture, and appearance. Within the pH range from 3 to 4 the personal judgments of the acidity of the apples were found to be closely related to the pH measurements.

Good flavor in cooked apples was found to be associated with relatively high acidity (from pH 3.1 to 3.39), firmness of the raw fruit, short storage periods, aromatic and spicy qualities, retention of natural flavor of the raw fruit, pleasant texture, and, for applesauces, a thin consistency. A pleasing texture in cooked apples was associated with relatively high acidity (pH less than 3.3), short storage periods, tenderness in the raw fruit, juiciness, fineness, and a quality described as meltiness, and, for applesauces, a thin consistency. Both flavor and texture in all varieties were less desirable after prolonged storage. Flavor was generally less satisfactory after January, while for some varieties texture remained comparatively satisfactory through March.

Attractive appearance in baked apples was associated largely with color and only slightly with retention of shape. This in turn was associated with relatively low acidity, tenderness in the raw fruit, and relatively poor flavor and texture. Attractive appearance in applesauce was associated chiefly with color.

The order of the 13 varieties on the basis of personal opinion ratings was not exactly the same for flavor, texture, and appearance. For flavor the ratings were as follows: "Group I, apples that tended to retain their natural fruity flavor and to be aromatic and spicy with a comparatively high acidity—Baldwin, Jonathan, Northern Spy, and Wealthy—or with a comparatively low

acidity—Cortland, Golden Delicious, McIntosh, and Winter Banana; group II, apples that tended to lose their natural fruity flavor and to lack aromatic quality and spiciness with a comparatively high acidity—Rhode Island Greening and Twenty Ounce—or with a comparatively low acidity—Fameuse, Red Canada, and Rome Beauty." Of those ranking highest in flavor and texture the Jonathan and Wealthy were also in the highest rating for appearance of both baked apples and applesauce and the Cortland for baked apples.

Mineral contents of Chinese foods, C. Y. Chang (*Chin. Jour. Physiol., 14 (1939), No. 2, pp. 133–145*).—Data are reported for the calcium, magnesium, potassium, sodium, phosphorus, chlorine, sulfur, and iron content of over 100 food items designated by the Chinese ideograms and the English equivalents. Scientific names are not reported. The analytical samples were thoroughly cleaned, then carefully ashed in platinum dishes, the mineral constituents being determined on the ash by standard methods and reported in terms of milligrams of constituents per 100 gm. of the original substance.

Nutrition: The newer diagnostic methods (*New York: Milbank Mem. Fund, 1938, pp. 192+[2], figs. 60*).—This volume of the proceedings of the round table on nutrition and public health held under the auspices of the Milbank Memorial Fund, March 29–31, 1938, consists of the following papers: The Medical Aspects of Problems of Nutrition, by A. G. Mitchell (pp. 7, 8); The Use of Roentgenology in Assessing the Nutritional State and in Detecting Certain Deficiency Diseases, by T. W. Todd (pp. 9–17); Dark Adaptation and the Diagnosis of Avitaminosis A, by S. Hecht (pp. 32–62); The Use of the Photometer in Detecting Latent Avitaminosis A, by J. B. Feldman (pp. 63–75); The Application of Electrocardiography in the Detection of Avitaminosis B_1, by S. Weiss (pp. 82–90); The Status of the Color Tests for Vitamin B_1, by S. Z. Levine and E. Marples (pp. 91–101); The Relation of Nicotinic Acid to Pellagra As Evidenced by Therapeutic Studies and Its Implications for a Diagnostic Test—a Progress Report, by T. D. Spies (pp. 103–113); Titration of Plasma Ascorbic Acid As a Test for Latent Avitaminosis C, by C. J. Farmer and A. F. Abt (pp. 114–130); Hematologic Methods in Detecting Nutritional Anemia, by G. M. Guest (pp. 138–158); and The Diagnosis of Nutritional Edema With Particular Reference to the Determination of Plasma Proteins and Consideration of Their Behavior, by J. B. Youmans (pp. 166–173). Most of the papers have extensive discussions.

Methods of conducting mass studies in human nutrition, P. B. Mack and J. M. Smith (*Pa. State Col. Bul., 33 (1939), No. 45, pp. VII+91, figs. 23*).—This monograph, based upon a thorough survey of the literature and a discussion of the extensive program of research in the field which has been in progress under the direction of the senior author since 1935 consists of three parts.

Part 1, Possible Methods for Human Nutrition Studies, classifies and discusses, with numerous footnote references, methods of judging nutritional status by physical examination, measurements of body build, determinations of skeletal status, ratings for dental status and condition of the soft tissues of the mouth, calculations of slump, measurements of plantar contact, measurements of basal metabolism, and tests for protein predeficiency, hemoglobin and red blood cell count, and vitamin A, B_1, C, and D status.

Part 2, Methods Used in the Pennsylvania Mass Human Nutrition Studies, lists the tests which have been selected for these studies on the basis of the following inquiries: "(1) Is the test possible with the funds available for the equipment and personnel which may be required for the study under consideration? (2) Is the test practicable from the point of view of the

time which subjects can conveniently spend in the laboratory? (3) Is the test one to which the subjects will submit willingly? (4) Does the test require participation of the subject in such a way that errors may occur through this participation?" Certain tests which have been originated or modified during the course of the investigation are described in detail, particularly the method of measuring mineral density of the bone noted above, the chemical tests of activity of saliva on human tooth enamel, plantar contact by the use of a Scholl pedagraph machine, and a method of handling biophotometric data from calculations of total, bleaching, and regeneration integration factors. Numerous roentgenograms, photographs, diagrams, and charts accompany the descriptive material.

Part 3, Results Obtained in the Pennsylvania Mass Human Nutrition Studies, consists of a critical discussion of the types of results which have been obtained by the use of the various test procedures and their significance.

Effect of vegetarian diet on rate of respiration of rat organs, C. Y. Chang (*Chin. Jour. Physiol., 14 (1939), No. 2, pp. 147–150*).—The respiratory rates of excised liver, kidney, heart, thyroid, and adrenals of vegetarian and of normal omnivorous rats of different ages were determined in the Warburg respiration apparatus. The findings, expressed as rate of oxygen consumption, indicate that the liver and heart of vegetarian rats have lower rates of respiration, while the thyroid and adrenals have higher rates than the corresponding tissues of omnivorous rats. The respiratory rate of the kidney is essentially the same in the two groups. It is considered that the lower rate of metabolism of the heart and liver of vegetarian rats is in keeping with the slightly lower respiration of the body as a whole. The thyroid of the vegetarian rats had about three times the normal weight, and it is assumed, therefore, that the much higher respiratory rate of the vegetarian thyroid is associated with this goitrous condition. The greater rate of respiration of the vegetarian adrenal is explained by the fact that it probably plays a greater role than normal in the controlling heat production and loss due to the lower amount of body fat in the vegetarian rats.

The reaction of the epiphyseal cartilage in normal and rachitic rats, J. A. Pierce (*Jour. Biol. Chem., 124 (1938), No. 1, pp. 115–124*).—A technic is described for determining in vivo the pH in distinct areas of the epiphyseal cartilage of normal and rachitic rats. By this method the animal, under amytal anesthesia, is manipulated so as to expose the cut surface of the upper part of the tibia which, though disarticulated, is still attached to the femur by muscular tissue and some skin. For the purpose of temperature control a beam of light is focused on the area which is flooded by the constant dripping of physiological saline saturated with quinhydrone. This solution serves to bathe the tissue and the inserted electrode, which is essentially an ordinary quinhydrone electrode fitted with a wire of smaller diameter (36 gage platinum iridium wire). The circuit is closed by inserting the slightly abraded tail of the rat into the KCl of the calomel half-cell.

Preliminary experiments testing this technic in vitro showed the flowing quinhydrone electrode to be as accurate as the conventional quinhydrone system. With this arrangement electromotive force readings were made at intervals of 20 sec. for 2–3 min. and the electrode then lifted and inserted in another area, the experiment being stopped when a brown coloration appeared on the surface of the tissue. The entire operation required about 10 min., during which time the animal was alive and the blood was in circulation.

With the temperature of drip at 38° C., the average pH of the epiphyseal cartilage of normal and rachitic rats was found to be 7.37 and 7.35, respectively,

for resting cartilage and 7.38 and 7.39, respectively, for proliferative zones. It is not claimed that these figures represent true pH due to changes taking place in the animal after dissection. The results, however, do not support the theory that local acidosis causes rickets or that local alkalosis favors normal localization of calcification.

Clinical studies of vitamin A (*Brit. Med. Jour., No. 4091 (1939), pp. 1141, 1142*).—This editorial presents a very brief survey, with literature citations of recent clinical studies that have demonstrated the beneficial effect of vitamin A therapy in the treatment of various pathological conditions.

Observations on estimating skeletal age from the Todd and the Flory bone atlases, S. I. PYLE and C. MENING (*Child Devlpmt., 10 (1939), No. 1, pp. 27-34*).—In this comparison 710 X-ray photographs of the hands of 72 girls and 79 boys taken at 3- to 6-mo. intervals and covering a range of from 3 to 60 mo. of age were evaluated for skeletal age by two observers, using both the Todd* and the Flory bone atlases for comparison. The minimum number of photographs for a single subject was 2, and for 17 of the children a complete series of X-rays was obtained at every age level within the period.

The children examined were more delayed in bone growth when rated by the Todd than by the Flory atlas and were consistently less mature than either standard. The children increased in skeletal age throughout the period of the study as uniformly as did the group on which the Flory standards were based. This comparison was not possible with the Todd atlas because of the absence of averages in the atlas, but it is thought that the latter, since it is constructed on the basis of a maximum of 6-mo. intervals, is "clearly advantageous for skeletal age assessments at all age levels below 6 yr. of age."

The growth of the long bones in 80 infants: Roentgenograms versus anthropometry, M. M. MARESH and J. DEMING (*Child Devlpmt., 10 (1939), No. 2, pp. 91-106, figs. 5*).—The study presents a method for estimating the rate of the growth process by measuring repeated roentgenograms of long bones. Results by this method are compared with the usual anthropometric measurements. From three to six measurements, made at approximately 6-week intervals, were made on each of the various subjects. Growth curves are presented, and the measurements which are reported in detail are subjected to statistical analysis.

The results show no essential difference between male and female children at this age, and indicate essentially straight-line growth for all bones measured. The coefficients of correlation for the individual bone lengths of each child against age are high, with mean values ranging from 0.977 to 0.997. Although the anthropometric measurements suggest straight-line growth of each child, the correlation coefficients of these measurements against age are not uniformly good, the mean values ranging from 0.795 to 0.896. Although individual rates of growth, as calculated by the method of least squares, are less variable for measurements from the roentgenograms than from the corresponding anthropometric measurements, still the mean rates of growth as calculated from the two measurements are comparable. Analysis indicates further that the error in anthropometric measurements is appreciable in contrast to measurements from roentgenograms, which are sufficiently accurate to be suitable for detailed analysis. For each of the long bones measured, growth in length appears to proceed at a uniform rate during the first 6 mo. of life.

The calcium requirements of five pre-school girls, J. OUTHOUSE, G. KINSMAN, D. SHELDON, I. TWOMEY, J. SMITH, and H. H. MITCHELL. (Univ. Ill.).

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* Atlas of skeletal maturation (hand), 1926–1936, T. W. Todd. St. Louis, Mo.: C. V. Mosby Co., 1937, pp. 203, [figs. 75].

(*Jour. Nutr., 17 (1939), No. 3, pp. 199–211, fig. 1*).—The objective in this investigation was the determination of the minimum amount of calcium which will insure maximum retention in well-nourished children over a relatively long period of time. Five healthy preschool girls were first given a basal diet adequate in all known nutrients except calcium and supplemented for several weeks with generous amounts of dicalcium phosphate to insure saturation of the tissues with calcium. In three succeeding periods of shorter duration the same basal diet was supplemented with milk solids to furnish calcium in smaller graded doses. To avoid monotony seven different groups of foods were selected, one for each day in the week. Seven-day consecutive metabolic periods were used.

The average calcium intakes in the four periods of 11, 8, 5, and 4 weeks each were 1,815, 370, 615, and 880 mg. daily, respectively, and the average calcium retentions 126, 76, 122, and 112 mg. daily, respectively. Thus on a diet furnishing 615 mg. of calcium daily, the average retentions were nearly the same as on the diet furnishing nearly three times as much calcium and somewhat higher than on the diet furnishing 880 mg. of calcium. Disregarding the first period of extremely high intake on the ground that some of the calcium in this period was used to replenish body stores, the maximum retentions for the individual subjects were 117, 84, 145, 154, and 124 mg., with an average of 125 mg. daily. These represented 7.8, 6.2, 8.3, 8.8, and 6.5, with an average of 7.5 mg. per kilogram of body weight. These results suggest that the daily growth requirement of these children was approximately 125 mg., with a standard deviation of ±2.7 or 7.5 mg. per kilogram of body weight with a standard deviation of ±1.1 mg.

In the diets on which four of the five subjects showed maximum retentions, approximately five-sixths of the dietary calcium was contributed by milk solids, the fluid equivalent of which amounted to approximately 440 cc. "Obviously, if these children had been receiving a diet generous in vegetables (such as is usually recommended for children of their age), it is altogether probable that the addition of a pint of milk easily would have supplied enough calcium to meet the requirements of all five of them." It is noted that the estimate of a pint of milk daily as sufficient for the calcium needs of these preschool girls agrees with the conclusions of Daniels et al. (E. S. R., 71, p. 881). The quantity of milk supplements in the two studies was approximately the same, but the basal diet of Daniels et al. was considerably richer in calcium.

The utilization of the calcium of milk by pre-school children, G. Kinsman, D. Sheldon, E. Jensen, M. Bernds, J. Outhouse, and H. H. Mitchell. (Univ. Ill.). (*Jour. Nutr., 17 (1939), No. 5, pp. 429–441*).—The methods followed in this study were based upon the theory advanced by Mitchell and McClure (E. S. R., 78, p. 83) that if there is a maintenance requirement of a mineral it is not represented in the retention as ordinarily computed as percentage of the intake, and that consequently the most practical measurement of the utilization of the mineral content of any food is that secured at a level of intake that barely suffices to cover the requirements of the subject. The effect of a possible maintenance requirement for calcium was eliminated by determining the calcium balances of the subjects at two levels of intake, both of which gave positive balances and were thus presumably above the maintenance requirement but neither of which was in excess of the minimum requirement for maximum retention of calcium. The percentage utilization was then calculated by the following equation in which *a* represents a period of high intake and *b* one of low intake within the prescribed limits:

$$\frac{\text{Retention for period } a\text{—retention for period } b}{\text{Intake for period } a\text{—intake for period } b}\times 100=\text{percent utilization.}$$

The data used for the calculations were taken from the study noted above and from a similar unpublished study conducted on six preschool boys. The average calcium intakes for the boys in periods II–IV, inclusive, were 340, 555, and 704 mg. and the corresponding retentions 56, 100, and 125 mg. The calcium contributed by the milk solids in the successive periods amounted to 258, 516, and 774 mg. daily for the girls and 231, 444, and 590 mg. daily for the boys. In calculating the utilization of the calcium from the intake and retention values periods II and III were compared for the girls and period II was compared with period III and also with period IV for the boys. The single values obtained for the individual girls were 18, 14, 22, 25, and 16 percent, respectively, and the mean values for the two comparisons for the boys 18, 21, 20, 13, 19, and 27 percent. The average value for the girls was 19 percent, for the boys 20, and for all subjects 19 percent, with a standard deviation of 4.5 and coefficient of variation of 23 percent. The average calcium retentions, expressed as percentages of intake for the individual girls in periods II and III, were 20, 14, 24, 22, and 20, with an average for all of 20 percent, and for the individual boys in periods II, III, and IV were 19, 21, 19, 15, 18, and 20, with an average for all of 18 percent. The total average for the 11 subjects was 19.2 percent.

The hypothesis that the maintenance requirement of calcium, as observed in adults, may be considerably or entirely suppressed in the growing animal is discussed from the data reported and also from the literature, with the conclusion that "if subsequent research should prove the above hypothesis and establish its general applicability to growing children, information of considerable practical value should result. One of the possible deductions might be that a value for percentage retention would be indicative of the extent to which the growing child can utilize the calcium of the usual mixed diet, or of how well he can utilize the calcium of a specific food when that food contributes the greater part of the total calcium intake. Thus, the values for percentage retention heretofore reported for those children who were fed submaximal levels of calcium could correctly be interpreted as percentage utilization. Another obvious conclusion would be that, in estimating a child's requirement for calcium, provision need be made only for the calcium requirements of growth."

Soy bean sauce with added calcium as a means of increasing calcium intake, K. H. Lee and H. Wu (*Chin. Jour. Physiol., 14 (1939), No. 2, pp. 175–185, figs. 2*).—In the interest of increasing the calcium content of the Chinese diet, soy sauce was suggested as a convenient vehicle for carrying added calcium salts. It was found satisfactory to fortify the low grade of soy sauce with 3 percent of calcium glutamate or to fortify the high grade with a 1.1 percent addition of calcium chloride. In the latter case the calcium salt was converted to the glutamate due to reaction with the sodium glutamate normally present in soy sauce. In calcium metabolism tests with rats, in which calcium glutamate constituted 6 percent of the diet and furnished most of the calcium, the calcium retention averaged somewhat more than 50 percent of the intake, or about 40 mg. per 100 gm. of body weight.

In growth experiments young rats on a vegetarian stock diet supplied with 2 percent of calcium glutamate attained at the age of 4 mo. an average weight about 25 percent greater than that of the control group which had not received the supplement. Reproduction and lactation records of other groups indicated that animals receiving the calcium supplement gave a more favorable response than those receiving the vegetarian diet alone. It is concluded that calcium in the form of the glutamate is satisfactorily utilized, and that its inclusion

in soy sauce (at a 3-percent level) would serve to increase the calcium intake of Chinese people.

Normal urinary fluorine excretion and the fluorine content of food and water, W. MACHLE, E. W. SCOTT, and J. TREON (*Amer. Jour. Hyg., 29 (1939), No. 3, Sect. A, pp. 139–145*).—In order to relate findings on the occurrence of mottled enamel and on the urinary excretion of fluorine to the general picture of fluorine intake, analyses were made to determine the fluorine content of foods from endemic and nonendemic regions. Analyses were made of representative samples of 51 foodstuffs obtained locally in the Cincinnati area, a nonendemic region. The values obtained indicated an average fluorine content of 0.917 mg. per kilogram. Excluding meats, fish, and dried foods, the average was 0.730 mg. per kilogram. On the other hand foods (chiefly vegetables, fruits, and cereals) grown on soils in endemic regions in Arizona averaged only 0.452 mg. per kilogram. The authors consider this difference in mean values to be significant, although the foods from the two regions were analyzed by different methods.

Further study of the fluorine values of Arizona-grown foods and of the corresponding water supplies indicated that there was apparently no correlation between the amounts of fluorine per liter of water and the concentration in the foodstuffs. Since fluorine in the water supply of Cincinnati amounted to less than 0.1 mg. per liter, it seemed apparent that the ingestion of fluorine in the foodstuffs accounted for most of the urinary excretion (approximately 1 mg. per liter) of this element. In the Arizona region, however, the proportion of fluorine furnished by the food was relatively unimportant, but there was a direct correlation between the amounts of fluorine in the drinking water and the concentration of fluorine in the urine samples examined. The values for water (0.3–8.1 mg. per liter) and those for urine (0.94–10.0 mg. per liter) were high as compared with values from the Cincinnati region.

"Comparison of the fluorine content of foodstuffs obtained in areas where mottled enamel is not found and in areas where it is endemic indicates that food plays a small role in the production of mottled enamel, and that amounts equivalent to or slightly greater than those encountered in food grown in endemic areas are not associated with the production of mottled enamel where there is not an accompanying elevation in the fluorine content of the drinking water."

A study of the comparative toxicity of cryolite fluorine and sodium fluoride for the rat, R. J. EVANS and P. H. PHILLIPS. (Wis. Expt. Sta.). (*Amer. Jour. Physiol., 126 (1939), No. 3, pp. 713–719, figs. 2*).—Growing rats were fed on fluorine-containing diets prepared from a basal ration containing approximately 17.5 p. p. m. of fluorine and variously supplemented with sodium fluoride, cryolite, or an aluminum chloride-sodium fluoride mixture containing the same proportion of aluminum and fluorine as pure cryolite. The fluorine supplements varied from 70 to 600 p. p. m. On the diets of lower fluorine content (70–150 p. p. m.) the growth response was normal, but at the higher fluorine content (600 p. p. m.) there was retardation of growth in all cases. The sodium fluoride supplement was apparently twice as toxic as the other fluorine supplements, judging by the degree of growth retardation. All of the diets containing more than 70 p. p. m. of fluorine caused bleaching of the incisors, the degree of bleaching being parallel to the inhibition of growth.

When the actual fluorine intake was plotted against the corresponding fluorine content of the skeletons of the animals, the curves indicated that at the higher levels of intake fluorine in the form of sodium fluoride caused greater skeletal deposition of fluorine than did the cryolite or aluminum

chloride-sodium fluoride mixture. At the lower levels of fluorine administration, however, the cryolite and the mixture caused almost the same fluorine deposition as did the sodium fluoride. This similarity of effect at lower levels was also demonstrated by an experiment in which fluorine was administered in the drinking water containing the element at the level of 4 p. p. m. furnished by sodium fluoride or by cryolite.

These results led to the conclusion that cryolite is toxic for the rat and that its toxicity is equal to that of sodium fluoride in trace levels: at higher levels, however, the toxicity is approximately half that of sodium fluoride. Apparently the sodium fluoride portion of the $AlF_3.3NaF$ molecule is responsible for its toxic properties, since the toxicity of cryolite is roughly proportional to its soluble fluoride content.

Hepatic injury on a nutritional basis in rats, P. György and H. Goldblatt (*Jour. Expt. Med., 70 (1939), No. 2, pp. 185–192, pls. 3*).—In 48 rats fed on the usual vitamin B_2-free diet, with cane sugar or rice starch as a source of carbohydrate and with supplements of vitamin B_1 and riboflavin or of vitamin B_1, riboflavin, and vitamin B_6, various pathological changes in the liver were observed. These changes, both macroscopic and microscopic, are described in detail, and photomicrographs are presented to show the gross and microscopic appearances. These changes were characterized mainly by parenchymatous and fatty degeneration, focal and massive necrosis, hyperemia, and hemorrhage, and in some of the rats perilobular and condensation fibrosis. Exclusion of infection and injury from an exogenous toxic agent as the cause of these pathological manifestations suggested that the liver changes might be of nutritional origin. That the etiology was based on nutritional causes was indicated by the findings that the addition of yeast or of Peter's eluate (yeast extract) to the diet regularly prevented this hepatic injury. On the basis of the evidence obtained it is assumed that the liver changes were correlated with a deficiency of a part of the vitamin B_2 complex.

Factors affecting the vitamin B_1 content of evaporated milk, F. W. Schlutz and E. M. Knott (*Soc. Expt. Biol. and Med. Proc., 40 (1939), No. 4, pp. 532–535*).—This investigation was undertaken because certain results in the authors' laboratory were not in agreement with those reported by Daniels (E. S. R., 80, p. 278), who used a modification of the authors' 10-day rat growth method (*E. S. R., 78, p. 427*) *but without certain improvements later introduced.* A sample of fresh raw milk from the same lot from which the evaporated milk was prepared was immediately iced and refrigerated for use during the entire 10-day experiment. The evaporated milk was stored at room temperature. Crystalline thiamin was used as the standard control. Some animals were given autoclaved whey as used by Daniels instead of autoclaved liver, and some were used for the second and third tests. As a further control, the curative technic, described by Supplee et al. (E. S. R., 81, p. 313) was used with one lot of evaporated milk.

The raw milk contained from 92 to 117 International Units of vitamin B_1 per quart and the evaporated milk from 61 to 93 units, the losses in the separate tests amounting to 34, 24, 21, and 20 percent. There was no difference in vitamin B_1 content between irradiated and nonirradiated evaporated milk. In the comparison of the growth and curative technics, 2.64 cc. of milk was equivalent to 1γ of thiamin by the growth method and 2.68 cc. by the curative method, thus indicating that the two methods give consistent results. Much poorer growth on the same quantities of thiamin was secured on a diet containing autoclaved whey than on autoclaved liver, suggesting that the whey ration was deficient in some vitamin B factor other than thiamin. In repeated 10-day assays, using

the same animals, the vitamin B_1 content was found to be 68 and 69 units per quart as compared with 63 units by the first assay. This is explained as due to the presence in evaporated milk of the factor which the whey failed to supply.

An increased destruction of vitamin B_1 in the evaporated milk on storage was shown by values of 80 I. U. per quart of one sample when first assayed, 68 units after 2 mo., and 59 units still later. These represent an increase in destruction from 24 percent in the original sample to 35 and 44 percent in the later assays. Similar changes were noted in the others. The increased destruction of vitamin B_1 in evaporated milk on storage is thought to explain the differences in the results which have been reported in the literature.

The occurrence of nicotinic acid in beef liver [trans. title], D. Ackermann and H. G. Fuchs (*Hoppe-Seyler's Ztschr. Physiol. Chem., 256 (1938), No. 2-3, pp. 90-94, figs. 2*).—The lysine fraction of the liver extract was freed of bases by precipitation with gold chloride, and the resulting filtrate was freed of gold and chlorides. The carefully neutralized solution was evaporated to small volume and precipitated with alcoholic picric acid. The precipitate, consisting of choline picrate, was removed from the mother liquor which was subsequently freed of alcohol and picric acid. When the resulting sirup, consisting of the free bases, was treated with concentrated hydrochloric acid, added drop by drop, a white powder formed and was completely precipitated out with alcohol. At this stage the yield was 0.85 gm. from 69 kg. of fresh beef liver. For purification the product was taken up in slightly acidified water and recrystallized. The process was repeated without acidifying the water. The resulting crystalline product, having every appearance of nicotinic acid, melted at 230°-231° [C.], with browning. The mixed melting point gave no depression. The reactions and the elementary composition corresponded to those of nicotinic acid. The product was finally identified by conversion to the flavianate.

The vitamin C content of spring greens, R. C. Burrell and H. A. Miller (Ohio State Univ.). (*Science, 90 (1939), No. 2329, pp. 164, 165*).—Values for the ascorbic acid content as determined by indophenol titration are reported for a number of wild plants used as spring greens in southern Ohio. The values as determined on the fresh samples are as follows: Burdock (*Arctium minus*) 0.696 mg., chickweek (*Stellaria media*) 0.377, curled dock (*Rumex crispus*) 1.349, dandelion (*Taraxacum officinale*) 1.546, milkweed (*Asclepias syriaca*) 6.556; pokeweed (*Phytolacca americana*) 2.735, skunkcabbage (*Spathyema foetida*) 3.15, small-leaved milkweed (*A. incarnata*) 2.537, sorrel (*Oxalis stricta*) 1.765, sowthistle (*Sonchus oleraceus*) 0.633, and wild lettuce (*Lactuca canadensis*) 0.036 mg. ascorbic acid per gram of fresh weight. A few plants which gave extracts colored by anthocyanins were first treated with a small quantity of Lloyd's reagent and centrifuged. The values obtained for these are shepherds-purse ([*Capsella*] *bursa-pastoris*) 1.296 mg., slender nettle (*Urtica gracilis*) 1.007, water cress (*Sisymbrium nasturtium-aquaticum*) 1.875, and wild carrot (*Daucus carota*) 0.748 mg. ascorbic acid per gram of fresh weight.

Vitamin C content of some Texas fruits and vegetables, W. W. Floyd and G. S. Fraps. (Tex. Expt. Sta. et al.). (*Food Res., 4 (1939), No. 1, pp. 87-91*).—A miscellaneous series of vitamin C determinations by indophenol titration is reported for Texas fruits and vegetables in terms of the results of individual tests, and averages for a single material, with calculated amounts of the food in question which would be required to furnish 20 mg. of ascorbic acid. The average values in milligrams of ascorbic acid per 100 gm. are summarized.

"Cabbage 130, mustard 165, peppers 104 to 281, and turnip greens 162 contained the highest quantities of ascorbic acid. Next came cantaloups 7.3 to 37, grapefruit 31 to 44, lemons 11 to 44, oranges 29 to 46, persimmons 43, and turnip

roots 47.1. Sweetpotatoes 20.8, limes 16 to 21, and tomatoes 17.9 contained appreciable amounts. Carrots, eggplant, grapes, onions, peaches, pears, plums, pomegranates, shallots, and watermelons contained less than 10 mg. of ascorbic acid per 100 gm. Appreciable differences between different varieties of the same plant were indicated, such as from 2.7 to 9.1 mg. per 100 gm. in nine varieties of watermelons, 29 to 46 in six varieties of oranges, 11 to 44 in seven varieties of lemons, and 7.3 to 37 in six varieties of cantaloups. Cantaloups, muskmelons, peaches, mustard, and persimmons contained more ascorbic acid than previously reported by other workers."

Influence of hyperthyroidism on vitamin C content of various endocrines and tissues, B. Sure and R. M. Theis. (Univ. Ark.). (*Endocrinology, 24 (1939), No. 5, pp. 672–678*).—Data, expressed in terms of content per gram of fresh tissue and in percentage change from normal, are given for the ascorbic acid content of tissues of growing and adult rats as affected by thyroxine, with and without supplements of vitamin B_1. The data indicate that there is a depletion of the stores of vitamin C in hyperthyroidism which is accentuated by vitamin B_1 deficiency. The marked reduction in the ascorbic acid content of the thymus, kidneys, liver, and heart were shown not to be due to changes in water metabolism. The administration of vitamins B_1 and C counteracted to a large extent the ascorbic acid losses. "The fact that the vitamin C content of the endocrines and tissues of the rat (which does not require ascorbic acid on a normal diet) suffers tremendous losses of this vitamin following toxic doses of thyroxine prompts us to suggest to the clinicians to administer ascorbic acid in larger doses as a supplement to vitamin B_1 (thiamin) to human cases of toxic goiter, particularly the nonoperative types."

The behavior of the thrombocyte count in relation to the injection of massive doses of vitamin C [trans. title], G. Papayanopulos and H. Schroeder (*Klin. Wchnschr., 18 (1939), No. 12, pp. 428, 429, fig. 1*).—The injection of from 100 to 7,000 mg. (100–1,000 mg. daily) of ascorbic acid in patients with various diseases called forth a thrombocytosis. The authors consider that this response was due to an irritation of the bone marrow, and that this in turn was associated with the pharmocologic action of the *l*-ascorbic acid rather than with its vitamin character.

Vitamin C requirement of man.—Prolonged study of daily excretion and *plasma concentration of vitamin C*, E. P. Ralli, G. J. Friedman, and S. Sherry (*Soc. Expt. Biol. and Med. Proc., 40 (1939), No. 4, pp. 604, 605*).—In this preliminary report data are given on the average excretion of ascorbic acid daily and the plasma levels three times a week of two male adults over long periods of time on graded doses of ascorbic acid. In the first case the determination of ascorbic acid in both plasma and urine was made by the indophenol titration method and in the second both by titration and by the use of the Evelyn photoelectric colorimeter, which gave significantly lower figures for urine but not for plasma. The subjects were hospitalized on basal diets containing constant minimal amounts of vitamin C and were given the ascorbic acid in divided doses of 50 mg. each at regular intervals during the day.

The first subject was observed for a total of 110 days, during which he received 50 mg. of ascorbic acid daily for 19 days, 100 for 53, 200 for 22, and 350 mg. for 16 days. On the 50-mg. dose the excretion was very low, averaging 11±4.6 mg. daily, and the plasma level averaged 0.85 mg. On the other doses the urine values increased from 20±2 mg. for the 100-mg. to 259±48 mg. for the 350-mg. dose. The plasma levels were nearly constant at 1.12, 1.14, and 1.15 mg. per 100 cc. The retentions or differences between intake and output were also very similar, being 80, 91, and 91 mg. These values are thought to indicate that the

patient was retaining a maximum amount of ascorbic acid on a daily dosage of 100 mg.

The second subject received no ascorbic acid for 6 days and 100 mg. daily for the next 52 days. Then followed a period of 2 mo. during which no observations were made, after which no ascorbic acid was given for 8 days, 50 mg. for 41, 75 for 43, and 100 mg. daily for 41 days. The urine values, as determined by the colorimeter, were within the very small range of from about 6 to 10 mg. During the first period the plasma level was only 0.24 mg. per 100 cc. This rose to 1.06 mg. by the end of the second period. At the beginning of the third period the level was 0.56, which fell to 0.27 at the end of 8 days and did not rise appreciably until the end of the fifth period when the value became 0.73 mg. per 100 cc. During the final period the plasma values rose to 1.43 mg. per 100 cc., and the average daily retention was 90 mg.

"From these observations it seems that the optimum intake of vitamin C daily is 100 mg. At this intake the blood plasma concentration will be maintained at or above a level of 1 mg. percent. If a greater amount of vitamin C is fed it is excreted in the urine."

The vitamin C requirements of pregnant and lactating women, K. U. Toverud (*Ztschr. Vitaminforsch., 8 (1938–39), No. 3, pp. 237–248; Ger., Fr. abs., p. 247*).—Normal, pregnant, and lactating women receiving a regular diet that furnished 30 mg. of ascorbic acid daily were given ½ l. of orange juice in saturation tests in which the urinary excretion of ascorbic acid for a 24-hr. period was determined, both on the day of the test dose and on the day preceding it. Whereas the 8 normal nonpregnant women excreted at least 50 percent of the test dose in 24 hr., the 12 pregnant women excreted no more than 26 percent of it and the lactating women not more than 20 percent even when the amount excreted in the milk was included in the calculation. When the ascorbic acid content of the daily diet was increased to a level varying from 75 to 100 mg. and the test dose consisted of from 250 to 500 mg. of pure ascorbic acid, only a few of the pregnant women and none of the lactating women showed a 50-percent excretion. It was not until the daily intake of ascorbic acid had been increased to 175–200 mg. that the pregnant and lactating women gave the 50-percent excretion of the test dose characteristic of the normal women receiving only 30 mg. daily. Even at the high intake it required 2–3 weeks for the pregnant women and 5–8 weeks for the lactating women to attain the saturation level.

Determinations of the ascorbic acid content of the blood indicated that during the saturation period there was an increase up to 1 mg. per 100 cc., and in a few cases the increase was even greater. Values of 0.6–0.8 mg. were, however, also found in blood even during complete saturation of the organism as judged by urinary excretion. The breast milk usually showed an increase in its content of ascorbic acid before increased excretion took place in the urine.

The production of rickets in rats fed diets containing oxalate, W. H. Adolph (*Chin. Jour. Physiol., 14 (1939), No. 1, pp. 51–58*).—This study was undertaken to determine the value of oxalate in effectively reducing the available calcium in diets devised for studying the low-calcium type of rickets. The control diet, consisting of 79 parts of corn, 20 of gluten, 1 of NaCl, and 0.88 part of KH_2PO_4, contained 0.075 percent of calcium and 0.449 percent of phosphorus, giving a 1:6 calcium-phosphorus ratio. The KH_2PO_4 in the test diet was then replaced by an equivalent amount of $K_2C_2O_4$ (0.88 percent of the diet calculated as $H_2C_2O_4$). The resulting ration contained 0.069 and 0.263 percent of calcium and phosphorus, respectively. That the effective calcium: phosphorus ratio was very low was borne out by the bone ash percent-

ages and line test results with young rats fed on the two diets. By these measures the oxalate-containing diet was shown to be more highly rachitogenic than the control diet, which produced only mild rickets.

TEXTILES AND CLOTHING

Apparatus for measurements of lengths of cotton fibers, B. Johnson (*Arkansas Sta. Bul. 381 (1939), pp. 22, pls. 3, figs. 7*).—The construction and operation of a mechanical fiber comber for seed cotton and a simple measurement of length of fibers combed in the device are described, with discussion of the advantages of this type of combing. The photoelectric cotton fiber sorter for seed cotton, based on the principle used by O. A. Pope and modified and described by the author (E. S. R., 79, p. 717), sorts the fibers on one seed or gives the sorting of a composite sample of as many as eight seeds at a time. It is possible to reproduce results of sortings from the same sample to within satisfactory limits of accuracy. Plans and specifications are given for the construction of both apparatus with instructions on their operation.

HOME MANAGEMENT AND EQUIPMENT

Personality development in farm, small-town, and city children, L. H. Stott (*Nebraska Sta. Res. Bul. 114 (1939), pp. 26*).—Three general home settings were compared as to their "favorableness" in regard to the personality development of the children growing up in them by means of the average scores made by representative samples of young people from each environment. The subjects were 1,855 high school students, of whom 695 had grown up and were living on farms in various parts of the State, 640 were children of parents not engaged in farming and were living in small towns of from 600 to 1,300 population, and 520 were from homes of various occupational and economic levels in the city of Omaha. Of 10 different aspects of personality selected for the study, 6 were measured by scales devised by the author (E. S. R., 80, p. 571) and the others by the use of Maller's case inventory.

In general, in aptitude, as indicated by the Otis I. Q. tests, the city group ranked highest and the farm group lowest for both boys and girls. In discussing these findings the author states that, in his opinion, "the average measured I. Q. of farm youngsters might be expected to rise with more stimulating school environments and with the increasing dissemination of culture into rural areas through the various agencies now at work."

In the area of social relationships as measured by two of the tests employed—resourcefulness in group situations and ethical judgment, the farm group again ranked lowest, with the city and small town about equal. The differences, however, were almost wholly contributed by the girls and are attributed in part to the fewer opportunities for social contacts of the farm girl. Happy and congenial family relationships are considered of great importance in setting up habits of congeniality which tend to function in all social situations. "To bring about through the medium of education in its various forms a better use of farm family leisure and a greater appreciation on the part of rural folks of the importance of congenial family relationships should do much to offset the disadvantages of the relative isolation of the farm home, so far as the development of desirable social traits and habits is concerned."

Most of the personality variables in which significant group differences were found had to do with personal adequacy involving particularly personal responsibility in maintaining satisfactory relationships with others and attitude

toward work. In these attributes the city group ranked first and the farm second. The lower average ratings of the small town group in these respects are thought to be due in some degree to certain inherent characteristics of the social situation in a small town, which may operate indirectly through the parents. The data showed that the small town families less frequently engaged in joint recreational activities both within and outside the home, and that the children were more frequently punished and also found more things to criticize in their parents than did those of farm and city families. "Again the possibility of improvement through educational means is suggested. Through the medium of parent education, not only may parental attitude be changed for the better but perhaps many of the conditions which give rise to unfavorable attitudes may also be changed."

Of the other personality aspects studied the farm group ranked higher than the town group but lower than the city group in personal adjustment and independence of decision in regard to personal problems and difficulties, and higher than the town but not significantly different from the city group in attitude toward home life. The differences were statistically insignificant between the farm and town group in rationality of thinking and among the three groups in honesty in the school situation.

Although the results of this investigation tend to support the conclusion that the general level of family relationships is higher in urban than in rural communities, the belief is expressed in conclusion that "as parents and prospective parents are led to realize the importance of congenial, confidential, and affectional relationships between parents and children, and of the utilization of family leisure in wholesome and stimulating joint recreational activities, there should result also a rise in the general level of personality adjustment of rural young people."

Some comparisons between analyses of narrative and film records of behavior and guidance of children, E. B. Waring, F. M. Dwyer, and E. Junkin ([*New York*] *Cornell Sta. Mem. 226 (1939), pp. 49, fig. 1*).—Sound film records made for another study on 3 children, selected because of reported food difficulties, and an adult during 11 meals at a nursery school were used as a criterion for the evaluation of 2 forms of narrative records (shorthand and longhand) made simultaneously for one of the children. All 3 records were analyzed by a system of guides for analysis of behavior and guidance which had been developed by the author and her associates and used in earlier studies (E. S. R., 74, p. 429). These guides are outlined briefly in the text and described more fully in an appendix, with illustrations from actual experience. The sound film record was analyzed jointly and the narrative records separately by the 2 observers.

Although shortcomings in the film record were recognized, it was assumed that the joint analysis of the film was a fair criterion for comparison and that the percentage of agreement with it was a fair measure of reliability for the analyses of the narrative records. With these assumptions, the analyses of both types of records by both observers led to the conclusion that the narrative records were reliable for analytical study, with the simple longhand narrative only slightly less reliable than the stenographic; that the 2 observers with adequate but different training and experience took comparable records of the same events and learned to use the guides for analyzing behavior and guidance with a high degree of accuracy, but that each was slightly more reliable in the analysis of the record which she had not taken than of the one she had taken herself; and that the analyses of periodical records from fall and spring were reliable in indicating changes in behavior and guidance.

Lepper, U. S. D. A. Food and Drug Administration, was elected secretary-treasurer. The retiring president replaced H. R. Kraybill on the executive committee.

Association of American Feed Control Officials, Inc.—This association held its thirty-first annual convention in Washington, D. C., on November 2 and 3, 1939. The total registration reached a new maximum of 160, drawn from about 30 States and the District of Columbia. The address of the president, L. M. Jeffers, dealt mainly with the aims, responsibilities, and opportunities for service of the association and was followed by a program along the lines of previous years. The technical papers included a discussion by H. W. Titus entitled Utilization of Feed by the Growing Animal. The vice president of the association, J. F. King, was elected president for 1940, J. B. Smith becoming vice president and H. A. Halvorson a member of the executive committee. L. E. Bopst, College Park, Md., was continued as secretary-treasurer.

Association of Land-Grant Colleges and Universities.—In addition to the general officers enumerated on page 5, the following section officers were elected at the Washington meeting of November 15–17, 1939: Agriculture, S. W. Fletcher of Pennsylvania, chairman, T. R. Bryant of Kentucky, vice chairman, and A. L. Deering of Maine, secretary; engineering, G. W. Case of New Hampshire, chairman, and P. S. Donnell of Oklahoma, secretary; home economics, Pearl S. Greene of Maine, chairman, and Margaret S. Fedde of Nebraska, secretary; and graduate work, C. O. Appleman of Maryland, chairman, and W. C. Russell of New Jersey, secretary. Within the section of agriculture, the subsection of experiment station work elected E. Secrest of Ohio, chairman, and C. R. Orton of West Virginia, secretary; the subsection of resident teaching, H. F. Cotterman of Maryland, chairman, and E. L. Anthony of Michigan, secretary; and the subsection of extension work, William Peterson of Utah, chairman, and J. E. Carrigan of Vermont, secretary.

Some changes took place in the membership of all committees except those on college organization and policy, instruction in agriculture, engineering experiment stations, relationships, influence of 4–H Club work, preservation of phosphate deposits, and accrediting. On the committee on instruction in engineering, H. A. Curtis of Missouri and L. J. Lassalle of Louisiana succeeded F. E. Johnson of Washington and Paul Cloke of Maine. On instruction in home economics, Mary L. Matthews of Indiana and Frances Smith of Montana were succeeded by Frances L. Zuill of Wisconsin and Minnie Price of Ohio; on experiment station organization and policy, J. C. Kendall by M. G. Eastman, both of New Hampshire; on extension organization and policy, R. K. Bliss of Iowa, H. H. Williamson of Texas, and Blanche Lee of Wisconsin by D. W. Watkins of South Carolina, H. C. Ramsower of Ohio, and Azalea L. Sager of Oregon; on military organization and policy, T. O. Walton of Texas by E. O. Holland of Washington; on radio, F. A. Anderson of Colorado and Wilmon Newell of Florida by J. W. Harrelson of North Carolina and W. W. Clark of Wisconsin; on land-grant institutions for negroes, W. C. John of Washington, D. C., by G. D. Humphrey of Mississippi; on rural youth, D. W. Watkins of South Carolina by R. G. Bressler of Rhode Island; on projects and correlation of research, Fred Griffee of Maine by C. A. Mooers of Tennessee; and on publication of research, L. E. Call of Kansas by V. R. Gardner of Michigan. A. N. Jorgensen of Connecticut and C. L. Christensen of Wisconsin were added to the committee on training for Government service. The committees on graduate work, the Federal-aid bill for education, and the conservation and use of potash resources were discontinued.

EXPERIMENT STATION RECORD

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RESEARCH AT THE 1939 CONVENTION OF THE ASSOCIATION OF LAND-GRANT COLLEGES AND UNIVERSITIES

As compared with recent years, one of the most striking differences as regards research at the November 1939 convention (E. S. R., 82, p. 1) was the increased opportunity for discussion afforded by the formal scheduling of preconvention sessions of the subsection of experiment station work. Informal conferences of the station directors have of course been held for some time, but they have not always prevented congestion in the two half-day sessions which have been the quota of late during the convention itself. Under the new plan, in addition to a half day given over to a joint meeting with the extension directors, 4 half days were available for the subsection's own program. There was also a free evening, and this was utilized for a revival of the directors' dinner, which proved especially timely in view of the recent heavy turnover in the group. In consequence of these opportunities more matters pertaining to research were considered than has usually been possible, and the more ample time promoted a general exchange of views and a clarification of numerous problems.

For the further facilitation of business, the initial day was spent in executive session. The first public address was that of Dean and Director Emeritus F. B. Mumford, of Missouri, whose paper entitled A Wider Recognition of Agricultural Research indicated that in a democracy sustained support of a project involves approval and recognition of its essential values. Dean Mumford pointed out that the experiment stations are in a favorable position to enlighten their public because of their relatively generous funds for publications and the opportunities for personal dissemination of results through extension workers. He believed, however, that the effectiveness of these means may be increased by simplification of technical publications and increased attention to the interpretation of results. He also advocated the taking up of problems of wider interest, supplementing production studies by "a general atttack all along the line on the use of agricultural commodities."

The topic Important Current Problems in the Administration of Agricultural Research was assigned to Assistant Director C. E. F. Guterman of the Cornell Station. First among these problems he placed that of selecting, developing, and holding a competent and productive staff. The administration of funds donated by commercial and private concerns; the increasing need for improved cooperation and coordination between the departments within the station, between stations in the region, and between stations and the U. S. Department of Agriculture; and the achievement of a proper balance between fundamental and applied or practical research and the giving of more publicity to the former were also considered important administrative problems.

Regarding commercial grants, Dr. Guterman concluded that "if the station has the necessary room, facilities, and staff and if the project is worthy from the standpoint of making a real contribution to agriculture, there is justification in going ahead, with considerable benefit to all concerned." In every case, however, the execution of a specific and legal memorandum of understanding between the stations and the donor was among the precautions recommended.

The importance of this matter was further recognized by the devotion of the entire closing session of the subsection to its consideration. The principal speaker was Director F. J. Sievers of Massachusetts in a paper entitled The Experiment Station and Industrial Service. This paper pointed out that the original concept of the experiment station as a place for testing out farm practices has become enlarged to include problems of the agricultural industry and even of society in general, but the speaker maintained that "to what extent and how an experiment station should enter this field of service must, in large part, be governed by the attitude and imagination of the director."

Director Sievers stressed the importance of refraining from the solicitation of private funds from commercial sources and of divorcing distinctly in the mind of the investigator any association between the source of the funds and the operations made possible by their use. He called especial attention to the opportunities available in Massachusetts for utilizing the graduate school as a means for carrying activities of this sort. "We have been able," he said, "to correlate and integrate these services so completely that it is difficult to locate the boundary line between our activities as these relate to the experiment station, private industry, and graduate school requirements."

It remained for Mr. R. W. Trullinger, Assistant Chief of the Office of Experiment Stations, to bring out the fact that for the fiscal year ended June 30, 1939, the experiment stations received approximately half a million dollars in grants and endowments from industrial sources, indicating that "the stations have definite and sizable responsibility for the wise use of these funds." In addition he pointed out

that the stations render an even more comprehensive service to industry in their publicly supported research in plant and animal science and their collateral chemical, bacteriological, entomological, and pathological phases as ultimately aplied to the processing, handling, storing, and distribution of agricultural products and in similar ways.

The subject of Federal-State relations again received considerable attention, not only as to its bearing on research but rather specifically in connection with the Federal action programs. The station subsection contributed to the theme with a paper entitled Administrative Necessity for Land-Use Planning, by M. S. Eisenhower, Land-Use Coordinator of the Department, and a discussion led by Acting Director S. W. Fletcher of Pennsylvania and Vice Director L. S. Ellis of Oklahoma. Restricting his discussion to the field of conservation, Mr. Eisenhower argued that "democratically organized and operated planning institutions are essential to concerted action toward a single conservation objective. The planning institutions must bring those who use the land—the farmers; those who develop additional facts—the research specialists; those who disseminate information—the educators; and those who are entrusted with administering the public aids for the land users—the administrators, into a cooperative job of fact finding and interpretation."

General acceptance of the need for planning, especially in times of emergency, characterized the discussions, but there was insistence that in any action programs the integrity and academic freedom of cooperating agencies should be safeguarded as far as possible. Undue rigidity of program was also deplored, and several speakers stressed the fundamental importance of research as a basis in both action and extension undertakings.

The history, procedures, and objectives of the National Soil Survey were outlined by Director M. F. Miller of Missouri and discussed from their respective viewpoints by Dr. C. E. Kellogg, Chief of the Survey, and Dr. A. L. Patrick, Chief of the Division of Watershed and Conservation Surveys of the Soil Conservation Service. How far the permanent value of these surveys should be subordinated by the incorporation of additional information of somewhat different type, such as data on erosion and similar matters for which there is immediate need, seemed to be the main point under discussion.

As usual, an important part of the subsection program was the presentation of committee reports. Prominent among these was the report of the committee on experiment station organization and policy, which dealt largely with a report from its subcommittee on home economics as to the varied status of research in that subject as indicated by a recent survey. Reference was also made to the possible bearing on subject-matter research of the use of George-Dern Voca-

tional Act funds for research in agricultural and home economics education.

A third topic to receive consideration by this committee was the uncertainty sometimes encountered in memoranda of understanding on cooperative projects. This subject was also touched upon by the committee on projects and correlation of research, which suggested a generalized form for such memoranda with a view to greater uniformity and coherence. The latter committee also favored the continued development of comprehensive outlines of new projects through the cooperation of the Office of Experiment Stations.

The report of the joint committee on publication of research was given by Acting Director Fletcher. During the year ended October 31, 1939, the number of manuscripts received for publication in the *Journal of Agricultural Research* totaled 140, of which 61 were from the Federal Department of Agriculture, 71 from the stations, and 8 cooperative. Dr. Fletcher also presented a report from the special committee on research monographs, advocating the encouragement of such publications, though not as a separate series.

A special committee on marketing research reported through its chairman, Director W. L. Slate of Connecticut, that marketing problems were seldom limited by State lines and that much regional cooperation had developed and is being extended. The provision of regional committees for the study of marketing of specific commodities, transportation, market facilities, and related lines was recommended.

A comprehensive report was rendered by the joint committee on the conservation and proper use of national potash resources. This report discussed the essential functions of potash in plant and animal nutrition, the available supplies in various sections of the United States, the world resources and production, the history and development of the United States potash industry, imports and exports, and the rational use of potassic fertilizers. Among the recommendations of the committee were the provision of chemical and technological researches to develop improved and more economical potassic fertilizers from the country's natural resources, and the obtaining of more information on the use of potassic materials in relation to soil types, crop requirements, and climatic conditions, with a view to their more rational utilization.

The committee on preservation of phosphate deposits and their national use presented an extensive compilation of data as to the status of existing deposits and the extent of their use. This report stressed the desirability of conserving American sources by a development policy based on a well-coordinated program of research with the experiment stations of the regions concerned as active participants. The committee was continued.

Outside the section of agriculture, somewhat more than the usual attention was accorded to research by other groups and the convention as a whole. In the section of home economics, in addition to the annual progress reports by Miss Sybil L. Smith of the Office of Experiment Stations and members of the staff of the Bureau of Home Economics, a discussion entitled Enlarging Our Research Program was presented by Miss Margaret S. Fedde of Nebraska. This paper pointed out the predominant concentration on food and nutrition studies and suggested the need of greater attention to problems in family economics, housing and equipment, family relations, and the appraisal and evaluation of teaching procedures.

The general sessions of the convention dealt mainly with other interests than research, but nevertheless provided the setting for one of the most constructive contributions on the subject. This was an address entitled A Chemist Looks at Agriculture, presented by Dr. Charles M. A. Stine, vice president of the E. I. du Pont de Nemours and Company. Dr. Stine deprecated an overemphasis of the dark side of agriculture as a decaying industry, and argued for a dynamic research policy. "Instead of contracting or stabilizing its facilities for scientific exploration and experiment, they should be tremendously expanded. . . . As much as $240,000,000 might be expended annually in the United States on agricultural research, and the expenditure would not be at all fantastic or out of line with the need. That sum would be only 3 percent of an eight-billion-dollar farm income. Moreover, it would be still less than the approximate total now being spent each year on research by American industry exclusive of agriculture."

Not only more research but more large-scale research was emphasized as the outstanding need and one which might well be supported by agriculture itself rather than through Government. "I envision a day," he said, "perhaps not nearly so distant either, when privately supported farm organizations will function not merely as marketing and purchasing cooperatives but also as research agencies. Their chief emphasis, indeed, may be on research efforts."

Much of this research, he believed, must be fundamental, although this would necessitate correct organization and coordination, sustained support, and patience. "On the average, it is about 8 years before a successful research project attains the profit stage. Moreover, its success may be based on fundamental discoveries that were a half century or longer in development." With a suitable environment, however, "ahead is a potential service to the Nation and the race that is limited in scope only by the ingenuity and the vision we can bring to its fruition."

These optimistic words well summarize the spirit of the convention.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

The effects of oven drying and air drying on the available nitrogen content of soils, P. E. Chu and F. E. Hance (*Hawaii. Planters' Rec.* [*Hawaii. Sugar Planters' Sta.*], *43* (*1939*), *No. 3, pp. 217–225, figs. 3*).—The authors propose a method for sampling moist field soils whereby reproducible analytical figures for available nitrogen (ammoniacal and nitrate) are obtainable quickly by means of rapid chemical methods. Such figures, based on the analysis of the original wet field soils, are believed to be not only more representative of the actual condition of the field soil at the time of sampling but are obtainable much more quickly and also more easily than when procedures based upon regular dried soil specimens are followed. Air-drying or drying in the oven at 60° or 100° C., even for short periods, usually changed the available nitrogen content of soils to a great extent. From the available soil nitrogen viewpoint, the least objectionable method of soil-drying is believed to be that of air-drying.

The phosphatase test: A review of the literature on its application for detecting irregularities in the pasteurization of milk and dairy products, L. H. Burgwald. (Ohio State Univ.). (*Jour. Dairy Sci., 22* (*1939*), *No. 10, pp. 853–873*).—A comprehensive review, with 44 references to the literature.

The relation of the refractive index of evaporated and condensed milk serum to the total solids content, S. G. Menefee and O. R. Overman. (Univ. Ill.). (*Jour. Dairy Sci., 22* (*1939*), *No. 10, pp. 831–840, figs. 4*).—Data are presented on the refractive index and total solids content of a series of condensed skim milk and evaporated milks, together with the derived formulas for estimating total solids on the basis of refractometer readings. It is concluded that a linear relationship exists between the total solids and refractive index of evaporated and condensed skim milk, but that a formula developed for one type of product cannot be used to compute quantitatively the total solids in every sample of that product.

Dichlorofluorescein to estimate salt content of butter, F. M. Skelton and L. R. Bryant (*Natl. Butter and Cheese Jour., 30* (*1939*), *No. 4, pp. 16, 17*).—A comparison of dichlorofluorescein and potassium chromate as indicators in the silver nitrate titration for salt content of butter indicates that the former can be used to advantage for this purpose.

Report of committee on laboratory methods, A. H. Robertson et al. (*Jour. Milk Technol., 2* (*1939*), *No. 4, pp. 184–187*).—A comparison of methods for determining the fat content of ice cream, with directions for conducting the Pennsylvania or Doan, Fucoma or Gerber, Illinois or Garrett-Overman, and Roese-Gottlieb tests.

The determination of vitamin A in its alcoholic form [trans. title], A. Chevallier, P. Dubouloz, and R. Matheron (*Compt. Rend. Soc. Biol.* [*Paris*], *131* (*1939*), *No. 16, pp. 372, 373*).—Vitamin A in its alcoholic form was obtained

by fractional extraction of the nonsaponifiable portion of cod-liver oil with ethyl alcohol varying progressively in concentration from 30 to 100 percent. The alcoholic form of the vitamin, free of any pigment, was found concentrated in the 60-percent ethyl alcohol fraction. Subjected to irradiation with a mercury vapor lamp, using the wavelength of 3,650 a. u., there was destruction of the vitamin. The resulting products gave an absorption curve having different maxima than those obtained when the esterified form of the vitamin was irradiated. The products of destruction apparently differed for the two forms of the vitamin, the decomposition products formed upon irradiation of the esterified form possessing at 3,250 a. u. an absorption equal to two-thirds that of the original vitamin, while those arising from the alcoholic form possessed instead an absorption at 2,500 a. u. representing approximately one-fourth of that of the original vitamin. It is suggested that the latter photochemical characteristic might serve as a basis for quantitative measurement of the alcoholic form of vitamin A.

Improvements in the use of the formaldehyde azo reaction for vitamin B_1, H. W. Kinnersley and R. A. Peters (*Biochem. Jour., 32 (1938), No. 9, pp. 1516–1520*).—Certain modifications of the previously reported formaldehyde azo reaction for vitamin B_1 [1] are reported in detail. The essential change involved the introduction of 30 percent ethyl alcohol as the reaction medium, this being necessary for full development of the pink color. Copper, mercury, and silver were found to interfere with the reaction. The vitamin B_1 values determined by this method, as applied to a 50 percent alcohol extract of the food, were compared with values obtained by biological tests with pigeons. The results reported for a yeast concentrate, wheat germ, oatmeal, corn, barley, and dried peas, beans, and lentils are in fairly good agreement by the two methods. Phosphoric esters of vitamin B_1 do not give the formaldehyde azo test. Treatment of the yeast extract with takadiastase succeeded in breaking up the phospho compounds so that approximately 90 percent of the combined B_1 was converted into the free form.

A new color reaction of vitamin B_1 (thiamin, aneurin), G. G. Villela and A. M. Leal (*Science, 90 (1939), No. 2330, p. 179*).—This preliminary report outlines briefly the photometric method developed. It is based upon the characteristic ability of thiamin to react with ammonium molybdate (in sulfuric acid solution) and aminonaphthosulfonic acid solution to give an intense blue color. Phosphates, if present, increase the intensity of the blue color, but if the organic matter is removed in a second sample by means of a sulfuric-nitric mixture and the determination again carried out, the difference between the first and second determinations gives the thiamin content.

[Chemical investigations of the Arizona Station] (*Arizona Sta. Rpt. 1938, pp. 9, 10, 13, 14, fig. 1*).—This report contains notes on seasonal variation in mineral composition of grapefruit juice and on the removal of fluorine in drinking water.

Unusual products of industry that originate on the farm, H. C. Hamilton (*Farm Res. [New York State Sta.], 5 (1939), No. 4, pp. 10, 11*).—This is a popular account of some of the products which may be manufactured from agricultural materials.

[Fruit and vegetable utilization studies] (*Farm Res. [New York State Sta.], 5 (1939), No. 4, pp. 7, 8, 11, fig. 1*).—Two popular articles are included, Many Fruits and Vegetables Going Into Juice on West Coast, by H. G. Beattie, and Canned Apple Juice Increasing in Popularity, by D. K. Tressler and C. S. Pederson.

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[1] Biochem. Jour., 28 (1934), No. 2, pp. 667–670.

AGRICULTURAL METEOROLOGY

Historical climatology, A. E. Douglass (*Carnegie Inst. Wash. Yearbook, 37 (1937-38), pp. 235-237*).—This is a progress report on studies of the relations between tree ring growth and climatic factors, and cyclic analyses and applications of the cyclograph.

***Special instruments and procedures of the* Agricultural-Meteorological Experiment Station of the Imperial Weather Service Ministry in Giessen and their objects and applications** [trans. title], W. Kreutz (*Bioklim. Beibl. Met. Ztschr., 6 (1939), No. 2, pp. 76-85, figs. 12*).—Described and illustrated are a lysimeter arrangement with lysigraph for studying soil climates, a minutely registering hygrometer with automatic charging and discharging appliance for investigating evaporation and the hygroscopicity of the soil, an indicator of ground water levels for obtaining such data in relation to soil moisture and temperature, and a climate chamber with experimental table and klinostat for obtaining data on the wind protection problem.

A filament-inserting resistance thermometer for determining the surface temperature of leaves [trans. title], A. Mäde (*Bioklim. Beibl. Met. Ztschr., 6 (1939), No. 1, pp. 11-13, fig. 1*).—The apparatus and its applications are described.

Tree temperatures and thermostasy, E. S. Reynolds (*Ann. Missouri Bot. Gard., 26 (1939), No. 3, pp. 165-255, pl. 1, figs. 21*).—As a basis for this monograph a continuous, accurate, detailed, automatic record of air temperatures and of cambium and center temperatures of a cottonwood (*Populus deltoides*) tree was kept for about 4 yr. Certain general results indicated that at about the zero point the tree temperatures usually do not follow immediately those of the air and often do not drop until after 24 hr. or more, whereas below zero as a rule they closely approximate those of the air. At high temperatures there was a thermostatic cooling action in the tree tissue which partly or completely counteracted the effect of the flow of heat inward. In extreme cases a temperature of ±15° C. was maintained with the air at ±42°, while the cambium was intermediate. High foliar transpiration producing a water deficit in the vascular tissues was indicated as inducing internal vaporization and consequent cooling of the center. At medium air temperatures the tree temperatures followed them but were considerably modified by thermostatic cooling and other factors. Detailed examinations during low temperature periods demonstrated that the center temperature has a distinctly modifying effect on that of the cambium, and similar studies of high temperature periods that the thermostatic cooling of the tree tissues is a universal phenomenon. During medium temperature periods thermostatic cooling was found to be effective in various years and essentially from the beginning of the period of full foliage, thus indicating that transpiration is the means by which air temperatures affect thermostatic cooling. The problem of "lag" throughout the records is discussed. While air temperature was the major factor in determining the broad limits of tree temperatures, its effect was greatly modified by various factors, which are discussed in detail.

"Some suggestions are made as to the possible relative importance of the main factors in influencing tree temperatures; the special value of this method of investigation as applied to certain other important problems in tree physiology; and the possible protective benefits which the plant may derive from the temperature adjustments studied in this paper."

Some effects of the 1936 drought on the forest at the Cloquet Forest Experiment Station, T. Schantz-Hansen and P. N. Jorānson (Univ. Minn.) (*Jour. Forestry, 37 (1939), No. 8, pp. 635-639*).—The differences between the

average surface areas of the needles of the native jack, Norway, and northern white pines produced during the drought year 1936 and those produced during the more normal year 1935 were found, without exception, to be significant. The length and probably also the surface area of balsam fir and black spruce needles were not reduced as a result of the drought. In a stand of Norway and northern white pines 30–40 ft. in height and located on a thin soil underlaid by rock, about half of the total number of trees and nearly all of the Norway pines were killed. It is believed reasonable to suppose that such a significant reduction in leaf area would be reflected in a decrease in the growth rate for the 1937 as well as for the 1936 season. Apparently the size and development of the needles of the three species of native pines depends on the growing conditions of the year in which they are produced.

An analysis of precipitation measurements on mountain watersheds, H. G. Wilm, A. Z. Nelson, and H. C. Storey (*U. S. Mo. Weather Rev., 67 (1939), No. 6, pp. 163–172, figs. 5*).—Within practical limits, the rain gage system employed in this study is said to give accurate results for most storms measured. To avoid employing an impracticably large number of gages the requirements for accuracy of averages should be modified in inverse relation to the size and importance of storms. With a system of gages distributed so as to sample rainfall variation as thoroughly as possible, a simple average of their readings will agree within close limits with rainfall catch computed from isohyetal maps. Application of the former technic requires much less time and skill than the isohyetal method.

Variation in rainfall over short distances at the Cloquet Forest Experiment Station, T. Schantz-Hansen and R. M. Brown. (Minn. Expt. Sta.). (*Jour. Forestry, 37 (1939), No. 10, pp. 804–806*).—Statistical analyses of rainfall catches in forest and open areas in northern Minnesota indicated that variations as great as 30–40 percent, but still without statistical significance, may occur within short distances. It is therefore concluded that the older data on the influence of forests on rainfall should be used with the greatest circumspection if at all.

Researches into the cause and prevention of frost damage, C. E. Cornford (*East Malling [Kent] Res. Sta. Ann. Rpt., 26 (1938), pp. 209–212*).—Observations of air currents on hillsides on radiation nights indicated the existence of two winds—the hilltop and the katabatic, and the effect of each on the other is described. Evidence is presented that when a katabatic wind moves down a slope its temperature does not necessarily decrease. Experiments designed to demonstrate the size of air temperature differences caused by differences in vegetation, altitude, and by a third unknown factor are described. Further preliminary studies indicated that certain conditions must be fulfilled (e. g., placement and screening of thermometers) in making a just comparison between the air temperature in a heated and that in an unheated orchard.

Studies in frost prevention, C. L. Fitch (*Iowa State Hort. Soc. [Rpt.], 73 (1938), pp. 366–369, fig. 1*).—This study indicates that the influences bringing about frosts on quiet nights or that prevent them may be extremely localized, even on areas as small as 1 sq. ft. Potato plants escaping frost damage when the rest of the fields are killed probably escape because they are later and have more abundant foliage, which, acting as a canopy, keeps in some of the ground heat.

Monthly Weather Review [May–June 1939] (*U. S. Mo. Weather Rev., 67 (1939), Nos. 5, pp. 125–161, pls. 11, figs. 5; 6, pp. 163–200, pls. 12, figs. 8*).—In addition to the usual detailed summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans

and on rivers and floods, and bibliographical and other information, these numbers contain an article noted on page 153 and the following contributions:

No. 5.—The Readjustment of Certain Unstable Atmospheric Systems Under Conservation of Vorticity, by V. P. Starr (pp. 125–134).

No. 6.—Preliminary Results of Pilot-Balloon Ascents at Little America, by G. Grimminger (pp. 172–175); Tropical Disturbance of June 12–16, 1939, by J. H. Gallenne (pp. 175, 176); and The Champlin-Anoka, Minnesota, Tornado, by M. R. Hovde (pp. 176–178).

SOILS—FERTILIZERS

[Soil investigations of the Arizona Station] (*Arizona Sta. Rpt. 1938, pp. 3–9, 10–13, 14, fig. 1*).—These have included work on soil structure in puddled soils, freezing-point studies, dilatometer studies, oxidation-reduction potentials of soils, copper in Arizona soils, grapefruit cannery waste as a soil corrective, microbiological soil studies (including inoculation experiments with alfalfa), soil reaction studies, and lysimeter studies.

[Soil investigations at the New Hampshire Station]. (Partly coop. U. S. D. A.). (*New Hampshire Sta. Bul. 313 (1939), pp. 4, 5, 13, 14*).—Plant metabolism experiments showing that potassium-nitrogen balance, as well as adequacy of supply, is necessary for good growth are reported upon by T. G. Phillips, T. O. Smith, and J. R. Hepler. Studies on carbohydrates in timothy are reported upon by Phillips and Smith; greenhouse tests on native soils, by P. N. Scripture and P. T. Blood; and flood damage in alluvial deposits, by W. H. Lyford, Jr. Testing of phosphatic materials of different strength and composition is also reported upon.

[Soil investigations by the New Jersey Stations] (*New Jersey Stas. Rpt. 1938, pp. 100–104*).—Results are noted of studies on nitrogen availability, phosphate fixation and availability, magnesian v. nonmagnesian forms of lime, influence of organic matter on crop yields and soil composition, testing soils for available constituents, the toxic effect of arsenic, effect of boron and manganese, influence of lignin on decomposition of cellulose and protein, production of lactic and fumaric acid by fungi, soil actinomyces, survival of micro-organisms introduced into soil artificially, and the relationship between micro-organisms and the root systems of higher plants.

[Soil Survey Reports, 1933 and 1935 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1933, No. 29, pp. 48, pls. 6, figs. 2, map 1; 1935, Nos. 7, pp. 28, figs. 2, map 1; 8, pp. 46, pls. 2, figs. 3, map 1*).—These surveys were made in cooperation with the respective State experiment stations: 1933, No. 29, Logan County, Ohio, J. T. Miller et al.; and 1935, Nos. 7, Decatur County, Iowa, A. W. Goke et al., and 8, Murray County, Okla., E. G. Fitzpatrick et al.

[Illinois soil reports] (*Illinois Sta. Soil Rpts. 64 (1939), pp. 26, figs. 11, map 1; 65, pp. 35, figs. 14, map 1; 66, pp. 48, figs. 21, maps 3*).—These reports add three further counties to those covered by State soil survey reports previously noted (E. S. R., 81, p. 171): Nos. 64, Stark County, E. Winters, Jr., and R. S. and L. H. Smith; 65, Boone County, H. Wascher and R. S. and L. H. Smith; and 66, Shelby County, H. Wascher and G. D. and L. H. Smith.

Soil conservation survey handbook, E. A. Norton (*U. S. Dept. Agr., Misc. Pub. 352 (1939), pp. 40, pls. 9, figs. 3*).—This handbook, after briefly defining the functions of the Department's Committee on Soil and Erosion Surveys, takes up the kinds of surveys, base maps for field surveys, mapping physical features of the land, mapping present land use, classes of land according to use capability, instructions for preparation of maps, correlation, soil samples, reports,

and conduct of the soil conservation surveyor toward the public. An appendix covers factors used in grouping soils, method of stating soil depths and slope limits, symbols, and classification of forage types on range surveys.

Economic aspects of soil conservation, W. W. WILCOX. (Iowa Expt. Sta.). (*Jour. Polit. Econ., 46 (1938), No. 5, pp. 702–713*).—This is a general discussion of the economic aspects and present programs for soil conservation.

Economic implications of soil conservation in Marshall County, E. C. WEITZELL. (Coop. U. S. D. A.). (*West Virginia Sta. Bul. 293 (1939), pp. 47, figs. 9*).—This report is designed to point out economic implications of changes resulting from the planned and managed program of soil and moisture conservation in areas specified and the tendencies toward such changes. To measure the progress of the soil and water conservation program and its effect on the agriculture of the area, farm practice and income records were obtained for farms in the area for the year 1935, before the program was established; the survey was repeated for the year 1937; and three additional annual resurveys are to be made. Some of the principal topics of the present report are description of area, economic evaluation of types and organization of farming in relation to soil conservation, certain factors directly affecting farm profits, and the recommended program of soil conservation.

Soil defense of range and farm lands in the Southwest, E. M. ROWALT (*U. S. Dept. Agr., Misc. Pub. 338 (1939), pp. [4]+51, figs. 23*).—This is a more or less popular account of the erosion problems and proposed control and preventive measures in a region including Arizona and New Mexico with parts of Utah and western Colorado.

Sand-dune reclamation in the southern Great Plains, C. J. WHITFIELD and J. A. PERRIN (*U. S. Dept. Agr., Farmers' Bul. 1825 (1939), pp. [2]+13, figs. 11*).—This deals with control and reclamation measures found effective in a study area of 2,000 acres in Dallam County, Tex. Active dunes of very recent origin, made possible by cultivation or overgrazing, followed up by the usual dune-forming agencies, and produced, in some instances, within the last 10 yr., were treated.

A "critical area" of hummocky land between the fully developed dune area and adjacent pasture lands was first treated, a tractor, a No. 2 terracer or a road grader, and a railroad iron serving to level the hummocks. The area was deep-listed and planted to sorghums, a crop capable of holding the sand from blowing across the hard, wind-swept land between the dunes. Dunes more than from 8 to 10 ft. in height were found to accumulate more sand than was blown from them, and various means of causing the wind to lower these dunes and redistribute the sand over the hard denuded land were used, lowering the level sufficiently to permit the planting of stabilizing crops. The hard land between the dunes was deep-listed to prevent the soil blown from one dune from being carried to another. Supplying the sandy soils removed from the dunes with sufficient moisture and managing them properly enabled them to support the vegetative cover necessary to soil stability. These soils were found especially adaptable to grain sorghums, a cover crop adequate to prevent erosion during the windy season.

Prevention and control of gullies, H. G. JEPSON (*U. S. Dept. Agr., Farmers' Bul. 1813 (1939), pp. II+60, figs. 41*).—The measures mainly emphasized in this publication are those designed to prevent the beginning of gully erosion, rather than the devices for the control and cure of damage already started. It is noted that prevention will require proper land-use, conservational farm practices on areas that contribute run-off to the gullies, retention and diversion of run-off water, conveying of water without further damage through any gullies already

existing, the use of vegetation in the prevention of gully erosion and in the restoration of preexisting gullies, etc. Measures for the restoration of damaged land, as well as preventive measures, are taken up, however. Natural and planted revegetation are considered; such structures as temporary check dams, permanent soil-saving dams, flumes, and culvert drop inlets are dealt with; and means for protecting banks of small streams, including jetties and protective vegetation, cribbing or riprap, and channel straightening, are described. A short final section stresses the necessity for systematic inspection and repair for the maintenance of preventive and control constructions.

The effect of irrigation and cropping on desert soils, C. W. Botkin and L. B. Shires (*New Mexico Sta. Bul. 263 (1939), pp. 39, figs. 8*).—The colloid from Pecos sandy loam showed a remarkable uniformity of composition to a depth of 8 ft. The colloids from corresponding horizons of the virgin and cropped soils were very similar both in the Pecos sandy loam and the Gila clay adobe. The principal change from 40 yr. of irrigation agriculture was a migration of from 1 to 1.5 percent of calcium carbonate to lower horizons. Changes in the other constituents, including potash, phosphorus, nitrogen, and organic matter, were small and not very significant. The composition of the soluble matter of the irrigation water has not materially changed during the 40 yr.

The colloids of these desert soils were found to be more nearly like the average igneous rock in composition than the colloids from the lateritic soils of warm humid regions, indicating that the desert soils are in the younger stages of the cycle of weathering. The silicate weathering in the 40 yr. of cropping under irrigation appeared to be of the same nature as that of humid regions, but was too slight for accurately estimating the "expectancy" of the soils in irrigation-years. It is estimated that, at the present rate of loss, the calcium carbonate will become exhausted from the surface horizon in from 50 to 75 yr., "but a much longer period is more likely." It is further noted that "calculations based on the rate of silicate weathering for the 40-yr. period are erratic, indicating between 400 and 2,500 irrigation-years until the soils have reached the lateritic stage. A much longer period is more probable."

The changes found in nutrients caused by the 40 yr. of irrigation agriculture were found small and not significant. Large quantities of potassium (92 to 545 lb. "potash" per acre) are supplied annually by the irrigation water. The levels of nitrogen and organic matter remained the same as in the virgin soils. An ample supply of calcium and potassium for hundreds of years is estimated.

Phosphate in Utah, J. S. Williams (*Utah Sta. Bul. 290 (1939), pp. 44, figs. 6*).—This bulletin contains phosphate tonnage estimates for Uintah, Duchesne, Daggett, and Cache Counties and partial estimates for Salt Lake, Wasatch, Summit, and Utah Counties.

Utah's reserve is found to be very largely in rock that is low grade according to present commercial standards. Available data on land ownership are sufficient to indicate that most of the richest, largest, or most accessible phosphate deposits are in private ownership.

Fertilizer analysis, W. L. Adams, T. Wright, Jr., and L. Linton (*Rhode Island Sta. Ann. Feed and Fert. Cir., 1938, pp. 63–79*).—Among 181 samples taken there were represented 47 brands guaranteeing 20 percent or more of plant food and 10 in which 40 percent or more was guaranteed. It is noted that "many farmers have materially reduced their expenditures for plant food by the use of high analysis brands."

Commercial fertilizers in 1938–39 and their uses, G. S. Fraps, T. L. Ogier, and S. E. Asbury (*Texas Sta. Bul. 577 (1939), pp. 59*).—The usual fertilizer analysis data are given for the 1938–39 season. Total tonnage was

somewhat increased over that of the preceding year, and most of the mixtures are included in about 20 analyses.

AGRICULTURAL BOTANY

Plant physiology [at the New Jersey Stations] (*New Jersey Stas. Rpt. 1938, pp. 85–94*).—Brief reports are given on studies of the effective range of boron concentration for soybeans, oats, and sunflowers grown in sand culture; growth of plants in sand supplied with solutions containing high concentration of chlorides; relation between nutrient ion proportion and growth of corn in artificial culture; organic acid and base content of corn plants as influenced by the pH of the substrata and the form of nitrogen supply; use of bentonite clay in sand culture as a nutrient source for potassium for the growth of tomato plants; utilization of phosphorus from nutrient solutions of different phosphorus concentrations by two different varieties of soybeans; importance of aeration in the comparative utilization of ammonium and nitrate nitrogen by tobacco plants; and the relation of the level of nitrogen nutrition of cucumber seedlings to susceptibility and resistance to infection by a *Pythium* type fungus causing damping-off.

[Report of the division of plant biology], H. A. SPOEHR ET AL. (*Carnegie Inst. Wash. Yearbook, 37 (1937–38), pp. 209–235*).—Progress reports are included on biochemical investigations (leaf pigments, CO_2 absorption by unilluminated leaves, and amylolytic activity of leaves), by Spoehr, J. H. C. Smith, H. H. Strain, and H. W. Milner; the quantum efficiency of photosynthesis, by R. Emerson and C. M. Lewis; experimental taxonomy (regional differentiation into ecotypes and ecospecies, the reaction patterns of ecotypes, equilibrium with the surroundings, chromosome number and environment, experimental results expressed in taxonomy, the selection experiment, etc.), by J. Clausen, D. D. Keck, and W. M. Hiesey; investigations on the cambium and its derivative tissues, by I. W. Bailey; desert investigations (the Sonoran Desert project, field investigations, environal conditions, and the behavior of desert plants), by F. Shreve, T. D. Mallery, and W. V. Turnage; and ecology factor and function in adaptation, by F. E. Clements, F. L. Long, and E. V. Martin, and climax, succession, and conservation, by F. E. and E. S. Clements.

[Abstracts of papers] (*Assoc. South. Agr. Workers Proc., 40 (1939), pp. 54, 63, 64, 145, 146*).—The following are of interest to botany: Germination of Untreated *Crotalaria spectabilis* Seed in Soil Supplied With Varied Amounts of Water, and Effects on Germination of Delay in Supplying Moisture, by J. F. Duggar (Ala. Polytech. Inst.); Technique in Colchicine Treatment of Pasture Plants and Seeds, by O. E. Sell (Ga. Expt. Sta.); and Effects of Indole-3-Butyric Acid in the Rooting of Transplanted Pecan Trees, by L. D. Romberg and C. L. Smith (U. S. D. A.).

The determination of small amounts of chlorophyll: Apparatus and method, E. S. JOHNSTON and R. L. WEINTRAUB (*Smithsn. Misc. Collect., 98 (1939), No. 19, pp. [1]+5, pls. 2, figs. 2*).—The method described is based on the transmission of light in the region of the red absorption band of a solution of chlorophyll in acetone, as determined by a galvanometer and thermocouple of extremely high sensitivity. The percentage transmission of the acetone extracts is then compared with a calibration curve constructed from data obtained with solutions of purified chlorophyll. The method eliminates the constant use of standard chlorophyll solutions and is uninfluenced by carotenoid pigments in the extracts. It is said to be unaffected by minor fluctuations in light intensity, and errors involved in subjective intensity and color comparisons are also avoided.

Physiology of lazy corn, J. Shafer, Jr. (Cornell Univ.). (*Bot. Gaz., 101 (1939), No. 1, pp. 68–80, figs. 3*).—Corn stems grow only in definite intercalary regions which are 1–4 mm. above the leaf insertions, and are 0–1 cm. long. Growth was induced in recently mature normal nodes by placing the plants horizontally. Such a position had no effect on the growth of lazy (a hereditary character) stems. Lazy stems tended to grow for a longer time than normal ones. The auxin yield of coleoptile tips was independent of laziness, but auxin was transported more readily by lazy than by normal stems. Auxin was so redistributed in horizontal normal stems that ±60 percent of it moved to the lower side, whereas this redistribution was reversed in the lazy stems. Low temperature delayed the time of appearance of laziness, but probably only by slowing up the growth rate.

Developmental changes in apical meristems, W. G. Whaley (*Natl. Acad. Sci. Proc., 25 (1939), No. 9, pp. 445–448*).—Ontogenetic changes in the apical meristems of three *Lycopersicon* species are described. The volume tended to increase during development, and the size of the meristem was correlated with that of the determinate organs which it produced. Apical cells and their nuclei showed a progressive diminution in size, a constant minimum size being attained at maturity. This change is believed to be related to the annual growth cycle of the plants.

Relative water requirement of Arizona range plants, W. G. McGinnies and J. F. Arnold (*Arizona Sta. Tech. Bul. 80 (1939), pp. 165–246, figs. 6*).—The water requirements of 28 Arizona range and 5 crop plants were determined under varying climatic conditions (1931–36), and the data obtained for the crop plants were used as a basis for comparing climatic conditions at the Desert Grassland Station on the Santa Rita Experimental Range with those at Akron, Colo., and elsewhere in the Great Plains area. The native species included perennial grasses of the desert and plains grasslands, southern tall grasses, winter and summer annuals, and xerophytic trees and shrubs. As a group the perennial grasses proved fairly uniform in water requirements. The summer annuals had lower water requirements than the winter annuals, and the latter were at least as efficient in water use as the perennial grasses. The summer annuals as a group had lower requirements than the perennial grasses, and the trees and shrubs had much higher water requirements than any other group. The perennial grasses showed a wide variation under different climatic conditions, both within and among species. Based on summer water requirements, blue grama, hairy grama, and Rothrock grama grasses, and curly mesquite were the most efficient, while tanglehead, cotton grass, slender grama, and black grama were intermediate in efficiency. In the fall-winter-spring period the most efficient grasses were tanglehead, smooth three-awn, and hairy grama, while the least so were feathergrass, blue grama, and side-oats grama. The water requirements of winter annuals had a wide range, the summer annuals were very efficient, and except for foothill paloverde the trees and shrubs all had very high water requirements. Water requirement values have some ecological significance, especially where a series of measurements are made for the same species under different climatic conditions.

Upward transport of minerals through the phloem of stems, F. G. Gustafson (*Science, 90 (1939), No. 2335, pp. 306, 307*).—In a previous paper (E. S. R., 79, p. 172) it was suggested that to get a quantitative comparison between conduction of radioactive phosphorus in the xylem and in the phloem that part of the plant above the cut should be ashed and the total activity determined. This has now been done with *Bryophyllum calycinum* and *Salix* sp., and from the results obtained it would seem that not as much minerals are conducted

through the phloem as previously supposed. Nevertheless, it is believed that there is undoubtedly some upward conduction of minerals in the phloem under normal conditions.

Solute transport in plants, A. S. Crafts. (Univ. Calif.). (*Science, 90 (1939), No. 2336, pp. 337, 338*).—The author describes experiments said to provide satisfactory evidence of the existence and characteristics of tensile sap columns in plants, and offers an explanation of subaqueous transpiration. When experiments on subaqueous water movement were set up using forked branches of lilac, ringing one of the branches favored eosin movement up the unringed branch, especially if there was an appreciable portion of bare stem below the fork to provide an adequate differential of living tissue to consume the moving assimilates. These results are believed to indicate that the rise of sap in the nonliving conduits of the xylem can be accounted for on purely physical grounds. On the other hand, they reemphasize the complexity of the over-all processes of translocation and point out the essential part played by living cells and tissues.

Studies on the sulphur metabolism of plants.—I, Preliminary investigations on the effects of different external concentrations of sulphate, ammonia, and cystine on the amounts of sulphur-containing compounds in leaves, J. G. Wood and B. S. Barrien (*New Phytol., 38 (1939), No. 2, pp. 125–149, figs. 5*).—Using varying dosages of K_2SO_4, NH_4Cl, and cystine applied to the culture medium in which plants of *Phalaris tuberosa* and *Lolium multiflorum* were growing, the following conclusions were drawn: Increase in sulfate sulfur under the experimental conditions failed to increase the cystine or protein sulfur in the leaves; increase in ammonia nitrogen increased the cystine and protein sulfur as well as the amino and protein nitrogen, which was accompanied by a decrease in sulfate sulfur; addition of cystine to the sand containing the plants caused an initial increase in sulfate sulfur but no changes in cystine or protein sulfur; in these experiments the ratio of protein nitrogen to sulfur remained approximately constant. The picture suggested is that ammonia nitrogen acts as a limiting factor in the formation of protein sulfur from sulfate, and a schema is presented for the probable sequence of reactions in sulfur metabolism. Analytical methods for determining various sulfur fractions are described.

Studies on antagonistic phenomena and cation absorption in tobacco in the presence and absence of manganese and boron, T. R. Swanback. (Conn. [New Haven] Expt. Sta.). (*Plant Physiol., 14 (1939), No. 3, pp. 423–446, figs. 10*).—Using the Havana seed type of tobacco commonly grown in the Connecticut Valley, the author studied the absorption of bases (mainly the cations K, Ca, and Mg) from water cultures and the interrelated antagonistic effects of these ions. A distinction was made between antagonism and pseudo-antagonism. It is shown that while K is antagonistic to Ca, the latter may under certain conditions become pseudo-antagonistic toward K, and the same situation is true of Ca v. Mg. Ca depressed the uptake and translocation of Fe and was antagonistic to Na, but aided the translocation of P. In general, it was found that B aided absorption and utilization of Ca. Mn under certain conditions had a regulating effect in the absorption of Ca, while the latter per se was antagonistic to Mn. A "translocation quotient" (Tq) is suggested for use in connection with absorption data in order to facilitate the interpretation of studies of this kind.

Will iodine come to be considered an essential plant nutrient? W. L. Powers. (Oreg. State Col.). (*Science, 89 (1939), No. 2315, pp. 434, 435*).—This is a brief summary of studies of the influence of iodine in water and soil cul-

tures, begun in 1929, and of iodine determinations in Oregon soils and waters. Mathematically significant increases in yields from use of iodine are reported, especially with alfalfa, clover, and lettuce, while germination was stimulated in corn. Iodine seemed to promote chlorophyll development, and soil micro-organisms appeared to be affected, particularly the legume nodule bacteria.

Localization of photoperiodic perception in Helianthus tuberosus, K. C. HAMNER and E. M. LONG (U. S. D. A. et al.). (*Bot. Gaz., 101 (1939), No. 1, pp. 81–90, figs. 4*).—Under the experimental methods described for the work here reported the evidence led to the conclusion that when exposed to short photoperiod, changes occur in the leaves of Jerusalem-artichoke which lead to tuber formation. Grafted plants also tended to confirm previous evidence that tuberization may be controlled by some substance with hormonelike properties.

Effect of variation in temperature during photoperiodic induction upon initiation of flower primordia in Biloxi soybean, M. W. PARKER and H. A. BORTHWICK. (U. S. D. A.). (*Bot. Gaz., 101 (1939), No. 1, pp. 145–167*).—Plants were grown in the greenhouse for 4–5 weeks and transferred to a series of control rooms where various temperature combinations during the photoperiod and dark period were applied for 5 days, 8- and 16-hr. days being used. Initiation of flower primordia was influenced much more by temperature variations during the dark than during the photoperiod. With temperature during the photoperiod constant, a 55° C. temperature during the dark period limited the amount of initiation occurring, but at 65° it was more extensive. Temperature variations resulted in the formation of different numbers of nodes, but these differences were not great enough to account for the differences in floral initiation. Fresh and dry weights, stem lengths, and leaf areas were also influenced by different temperatures. As the temperature during the dark period was increased the carbohydrates decreased and the nitrogen fractions increased, but these changes could not be correlated with morphological responses. None of the temperature combinations used induced the initiation of flower primordia under photoperiods of 16 hr.

Sunlight-nitrogen relationships, R. J. BORDEN (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 43 (1939), No. 3, pp. 227–235, figs. 2*).—The two sugarcane varieties 31–1389 and H 109 responded somewhat differently to variations in exposure to direct sunlight, the effects being generally more pronounced on the first. The commonly accepted opinions on the various effects of nitrogen on cane growth and composition were confirmed. Though abundant sunlight and an adequate supply of available nitrogen are known to be prime requisites for successful sugar production, the preliminary results of the tests reported indicated no significant interaction between the two.

Unusual physiological responses induced on intact plants by capping with black cloth, A. E. HITCHCOCK and P. W. ZIMMERMAN (*Contrib. Boyce Thompson Inst., 10 (1939), No. 4, pp. 389–398, figs. 2*).—Capping the upper part of tomato plants with black cloth for 3–14 days induced physiological responses such as leaf epinasty, swelling, proliferation (including intumescences), growth inhibition, initiation of adventitious roots, and disturbance of apical dominance correlations. These typical responses resembled those induced by such growth substances as indoleacetic, indolebutyric, and naphthaleneacetic acids, and ethylene at 1–500 p. p. m. The size of these responses indicated them to be due to an increase in the formation of natural hormones and not entirely to a redistribution of those existing during capping. Although premature growth of the axillary buds on capped plants indicated a decrease in the apical dominance effect, other responses showed that a marked increase in hormone production had occurred. Thus at least a partial separation of the bud-

inhibiting influence from that of other natural hormone effects was obtained in the treated plants. Insofar as the initiation of the various well-known physiological responses was concerned, the stimulus elicited by capping was essentially the same as that furnished by applying the various synthetic growth substances.

Respiration of gladiolus corms during prolonged dormancy, F. E. DENNY. (*Contrib. Boyce Thompson Inst., 10 (1939), No. 4, pp. 453–460, figs. 2*).—Gladiolus corms kept dormant for 5–18 mo. by replanting in moist soil soon after harvest and storing moist at room temperature exhibited a very low rate of CO_2 production during the first 4 hr. after removal from the soil. Immediately or soon thereafter the rate rose and reached a maximum ±20 hr. later, when the CO_2 output was 5-, 10-, or 30-fold, or even larger. The rate then decreased until after about 5 days it approached but did not reach the low shown at the time of removal from the soil. When replanted in soil the respiration rate returned again to the low values, but if only ±4–6 weeks elapsed before removal for a second test, the large gain in respiration during the 24-hr. period after removal from the soil so characteristic in the first test did not now occur. However, when the sojourn in the soil was as long as 3 mo. this large gain in respiration was again observed. These changes in CO_2 output occurred without change in temperature. When the respiration of corms had been increased manyfold at some stage of the tests, they failed to sprout on replanting in soil but continued in the dormant state.

Electrodialysis of pea seeds, W. R. MULLISON (*Plant Physiol., 14 (1939), No. 3, pp. 583–587, figs. 3*).—It is deemed evident from the data obtained that electrodialysis has detrimental effects on the germination percentage, resistance to infection, and subsequent seedling development. If treatment is not too long continued, the plant is apparently able to replace the lost electrolytic material, at least in part, by that obtained from the soil. If the seeds are electrodialyzed for too long a period, their viability is lost.

Experiments with vapors and solutions of growth substances, P. W. ZIMMERMAN and A. E. HITCHCOCK (*Contrib. Boyce Thompson Inst., 10 (1939), No. 4, pp. 481–508, figs. 7*).—The results reported involved 54 physiologically active substances designated as growth substances, over half of which were previously reported to be active as vapors (E. S. R., 81, p. 631), and 33 plant species from widely separated groups. The new compounds tested numbered 28.

The responses induced were of a formative nature, usually affecting particular organs or parts in contrast to the effects of fertilizers. Downward growth of leaves, enlarged stem tips, positive geotropism of stems, hypertrophies, parthenocarpy, and induced adventitious roots are examples of the formative effects or "induced abnormalities." Many qualitative differences in responses were induced by the 54 substances, but they possessed in common the capacity to induce epinasty in tomato leaves, and all chemical compounds able to elicit this response similarly to that induced by ethylene gas have been called "growth substances." It was shown by the cinema that after exposure to vapors of methyl α-naphthaleneacetate, tomato plants responded in 20 min., and tobacco plants in 30 min. Plants treated with vapors of the more active growth substances gave off emanations affecting other plants standing nearby. During the first hour after holding in darkness the treated plants evolved less CO_2 than controls, but for the next 5 hr. they exceeded the controls. By exposure to such vapors many plant species were induced to form adventitious roots on leaves, stems, roots, and cuttings. Phenyl growth substances applied as vapors broke the rest period of dormant potatoes in contrast to the naphtha-

lene substances which inhibited bud growth. The specific reactions of many other plants are described and discussed. The bibliography contains 16 references.

Leaf growth hormones.—I, A bio-assay and source for leaf growth factors, D. M. Bonner, A. J. Haagen-Smit, and F. W. Went (*Bot. Gaz., 101 (1939), No. 1, pp. 128–144, figs. 6*).—In this preliminary report a quantitative bio-assay for hormones controlling leaf growth is described, including the general type of leaves, the method of using them, and suitable methods for measuring the increased growth of isolated leaf sections. The sources of these growth factors are classified as seed diffusates and leaf extracts. Yeast extract was also found to be a good source of these factors. The basic medium of the leaf test is a 1 percent sucrose solution, used in order that the growth rate of the leaves may not be limited by sugar. Units and standards in the leaf test are described, and a solution of "standard activity" and a "leaf unit" are defined. The general nature of the growth response to pea diffusate is discussed. In both *Raphanus* and *Nicotiana* there was an increase in area and in thickness of the sections grown in pea diffusate. Cell enlargement also appears to be greater, with a separation of spongy parenchyma and formation of more intercellular air spaces.

Growth factors for bacteria.—VIII, Pantothenic and nicotinic acids as essential growth factors for lactic and propionic acid bacteria, E. E. Snell, F. M. Strong, and W. H. Peterson. (Wis. Expt. Sta.). (*Jour. Bact., 38 (1939), No. 3, pp. 293–308*).—Continuing this series (E. S. R., 81, p. 352), the factor previously described as necessary for growth of all lactic acid bacteria is now identified with pantothenic acid, and convenient methods for preparing highly active concentrates are described, together with experiments giving further information on its properties. Nicotinic acid greatly stimulated growth and acid production by some but not all lactic acid bacteria, and is regarded as essential for certain members of this group. Other unidentified factors are also required by these bacteria for growth on highly purified media.

Some growth factors for hemolytic streptococci, D. W. Woolley and B. L. Hutchings (Univ. Wis.). (*Jour. Bact., 38 (1939), No. 3, pp. 285–292*).—Using an alkali-treated medium it was shown that a number of hemolytic streptococci require riboflavin, pantothenic acid, and a suitable reducing compound (the last, however, not being specific). For most of the organisms studied sodium sulfide proved beneficial, and for a few it appeared to be essential. A few organisms were found which required some, but not all, of the alkali-labile factors.

Structure and synthesis of a plant wound hormone, J. English, Jr., J. Bonner, and A. J. Haagen-Smit (*Science, 90 (1939), No. 2336, p. 329*).—A crystalline substance possessing wound hormone activity which was isolated from the water extract of green string beans was found by analysis to be 1-decene-1,10-dicarboxylic acid with the formula $C_{12}H_{20}O_4$. The structure was confirmed by synthesis of the product, which was found to be identical with the natural substance both in chemical properties and in physiological activity. It was capable of evoking intensive wound periderm formation in washed disks of potato tuber. The name traumatic acid is suggested as appropriate.

Comparative activity of root-inducing substances and methods for treating cuttings, A. E. Hitchcock and P. W. Zimmerman (*Contrib. Boyce Thompson Inst., 10 (1939), No. 4, pp. 461–480, figs. 3*).—Treatment of cuttings (gymnosperms and angiosperms, annuals and perennials) with root-inducing substances applied as relatively dilute or concentrated solutions or as powders produced essentially the same rooting responses. The optimum concentration requirements varied according to the kind and form of substance, kind of carrier of solvent,

plant species, age and relative activity of shoot, time of year, and method of application to the cuttings. The physical characteristics of the test powders appeared to account mainly for the differences in the effective range in concentration of 4–50 mg./gm. for the coarser test powder and 0.5–12 mg./gm. for the finer one. The concentrated solution and powder dip methods were about equally effective on the weight basis but represented concentrations 10–1,000 times those inducing equivalent root formation according to the standard solution method of treatment. Potassium salts were consistently more effective than the acids, which appeared to be due partly to solubility relations. Indolebutyric acid or salt was more effective on most species than indoleacetic or naphthaleneacetic acids. The high activity of potassium indolebutyrate suggested that it may be of considerable practical importance. Talc controls exhibited better rooting than nontreated or tap-water controls. At least part of the beneficial effect of talc appeared to involve water relations, since the cuttings always showed less evidence of lack of water than either type of control. An ingredient of the control talc, soluble in chloroform, proved to be physiologically active when tested on tomato plants. Treatment of some 70 species included types readily rooted, as well as those moderately or definitely difficult to root. Lilac varieties rooted in 24–39 days when treated with indolebutyric acid applied as a powder.

A plant growth inhibitor and plant growth inhibition, W. S. Stewart (*Bot. Gaz., 101 (1939), No. 1, pp. 91–108, figs. 11*).—An ether-extractable substance capable of inducing growth inhibition and positive *Avena* coleoptile curvatures was found in radish cotyledons and leaves, as well as in other plants. With growth of radish leaves their inhibitor content decreased and was finally replaced by auxin. This inhibitory substance had no acid or basic groups and could be readily hydrolyzed to form a growth-promoting substance. The inhibitor had no polarity of movement in radish or oat plants. Auxin contaminating the crude inhibitor could be removed by the "inverse transport" purification method. The inhibitor could be hydrolyzed at cut surfaces of plants to form auxin, and it was transported through *Avena* coleoptiles at ±11 mm. per hour, i. e., at the same rate as auxin. In many tests of physiological activity the inhibitor behaved like auxin. It is concluded that the auxin diffusing from radish cotyledons is possibly indoleacetic acid.

The influence of 3-indole-acetic acid on pollen germination, P. F. Smith (*Science, 90 (1939), No. 2329, pp. 163, 164*).—In preliminary tests using pollen grains of species of *Tradescantia*, *Polygonatum*, *Lathyrus*, and *Pinus*, a concentration of 1 : 1,000,000 of 3-indole-acetic acid shortened the period of germination, increased the rate of pollen-tube enlongation and total tube length at the end of 4 hr., and gave a much higher percentage of germination in all cases. The pollen of *Pinus austriaca* was stimulated to germinate, while without its use no germination occurred.

Function of vitamin B_1 in anaerobic bacterial metabolism, M. Silverman and C. H. Werkman (*Iowa State Col. Jour. Sci., 13 (1939), No. 2, pp. 107–113, fig. 1*).—"Vitamin B_1 is essential for anaerobic dissimilation of pyruvic acid by the heterolactic acid bacterium, *Lactobacillus mannitopoeus*. The anaerobic dissimilation of glucose, lactic acid, and several other substrates by *Propionibacterium pentosaceum* is stimulated by crystalline vitamin B_1. 2-methyl-5-bromomethyl-4-aminopyrimidine hydrobromide and 4-methyl-5-β-hydroxyethylthiazole cannot replace vitamin B_1 either as a growth factor or metabolic stimulant in the enzyme system of *P. pentosaceum*. Evidence is presented for the occurrence of cocarboxylase in bacterial cells."

Studies on the life and death of bacteria.—I, The senescent phase in aging cultures and the probable mechanisms involved, E. A. Steinhaus and J. M.

BIRKELAND. (Ohio State Univ.). (*Jour. Bact.*, 38 (1939), No. 3, pp. 249–261, figs. 3).—Periodic counts of aging broth cultures of *Sarcina lutea* and *Serratia marcescens* showed the numbers of cultivable bacteria remaining to be remarkably high even after 2 yr., and similar findings were obtained with a number of other organisms. Readjustment of *S. marcescens* cultures from pH 9 to 7 gave a definite increase in the number of viable organisms. Microscopic examination of these aging cultures failed to show much cellular variation, though on plating colonial variation was in some cases evident. The species retained their physiologic and gram-staining characteristics, and rough determinations indicated that the aging cells possessed a marked resistance to adverse environal conditions. Plotting the counts logarithmically, the resulting curve, after the initial drop following the maximum stationary phase, tended to level off and maintain an almost imperceptible decline, though small rises and falls were still apparent during this period. The term "senescent phase" is suggested for this period of the curve. Varying degrees of growth were obtained with 21 strains of organisms on media in which the only source of nutriment was a large amount of washed and autoclaved bacterial cells. The term "cannibalism" is used to designate the growth obtained in cultures where the dead cells are serving as a source of food.

Stimulative effect of short wave lengths of the ultraviolet on the alga Stichococcus bacillaris, F. E. MEIER (*Smithsn. Misc. Collect.*, 98 (1939), No. 23, pp. [1]+19, pls. 4, figs. 2).—Increased cell multiplication in this green alga was stimulated by sublethal exposures to ultraviolet light at 2,352, 2,483, 2,652, and 2,967 a. u., the optimum occurring at about two-thirds of the lethal exposure. This stimulative effect persisted in cultures for 2 yr., at the end of which time the cells in the stimulated cultures were still in better condition than those in the controls. The cells from the stimulated cultures were slightly shorter and wider than those in the controls. There are nearly two pages of references.

Studies on the methane-producing bacteria, I, II, H. HEUKELEKIAN and B. HEINEMANN. (N. J. Expt. Stas.). (*Sewage Works Jour.*, 11 (1939), No. 3, pp. 426–444, figs. 7).—Two papers are included:

I. *Development of a method for enumeration* (pp. 426–435).—The method for enumerating these organisms in sewage solids concerns use of optimum pH (7), temperature (28° C.), and concentration of organic substrate. Addition of yeast proved of considerable value in speeding up the growth rate in media.

II. *Enumeration in digesting sewage solids* (pp. 436–444).—Using the technic noted above, the numbers of methane-producing bacteria present during the course of digestion of seeded, limed, and untreated solids were determined. The results indicated that the organisms capable of producing methane from calcium acetate, butyrate, and ethyl alcohol in synthetic media were present in digesting sewage solids and their numbers were indicators of the course of digestion. The results are discussed in detail.

Microbic dissociation and the classification of bacteria, O. RAHN. (Cornell Univ.). (*Zentbl. Bakt.* [etc.], 2. Abt., 100 (1939), No. 18–23, pp. 369–372).—All taxonomic systems of bacteria now in use are based on the assumption that the properties used in the descriptions are constant, whereas all bacteriologists now realize that most of these properties, and even those used in defining genera and families, are changeable and may be irreversibly lost. Nevertheless there is no choice, for there can be no theoretical or applied bacteriology without nomenclature, and present knowledge of variability is too incoherent as yet to permit of a classification which considers the range of variability of each species. One reason for the slow progress is considered to lie in the circumstance that not a single professorship for bacterial taxonomy exists.

Several family names used in a system proposed by the author have been modified according to the rules of international nomenclature.

The history of bacteriology, W. BULLOCH (*London and New York: Oxford Univ. Press, 1938, pp. XII+422, pls. 16, figs. 36*).—The subject matter of this history is grouped under 11 headings, viz, ancient doctrines on the nature of contagion; contagium animatum; fermentation; spontaneous generation and heterogenesis; putrefaction and putrid intoxication, including ptomaines; discussion on pyemia, septicemia, and surgical sepsis; specific element in disease; classification of bacteria; cultivation of bacteria; Pasteur's work on attenuation of virus; and history of doctrines of immunity. Bibliographies to the individual chapters cover 64 pages, and biographical notices of some of the early workers in bacteriology 58 pages. There are indexes of personal names and of subjects.

Interpretation of comparative growths of fungal colonies growing on different solid substrata, C. L. WORLEY. (Univ. Ga.). (*Plant Physiol., 14 (1939), No. 3, pp. 589–593, figs. 2*).—A survey of the literature indicated two viewpoints regarding the most accurate method of interpreting the growth extent of a fungus mat on solid media, some holding that a comparison of the radii is a better criterion of actual growth rates, while others maintain that the ratio of the respective areas is the better. The author presents a third method of calculation, the sector-area method, which "takes into consideration (1) growth in the radial direction; (2) growth in the tangential direction; (3) the number of units contributing to the subsequent growth; (4) the relationships of initial and of total growths, and consequently, of the new increments of growth for the two colonies compared; and (5) the relative importance of radial and tangential growth quantities depending on previous conditions. The radial method fails to consider steps 2, 4, and 5 above. The ring-area method omits steps 3 and 4, and either exaggerates or diminishes markedly step 5. It is to be remembered that the sector-area method is to be employed only for detecting the effect of a given substrate, as compared to a control, from one time interval to the next and for calculating successive growth rates of a given colony. The total-area method is best adapted for calculating the cumulative effects, while the total-radii, the difference of radii, and the ring-area methods prove to be inadequate for any type of measurement yet made for the growth of a fungal mat on solid nutrient media."

The mycological collections of the Bureau of Plant Industry, J. A. STEVENSON (*U. S. Dept. Agr., Bur. Plant Indus., 1939, pp. 14*).—This is a brief summary of their contents and a guide to their use.

Notes on Florida fungi, E. WEST. (Fla. Expt. Sta.). (*Mycologia, 31 (1939), No. 4, pp. 423–432, figs. 3*).—Notes are presented on 21 fungus species collected in various sections of the State, extension of the previously published host or geographical range forming the basis of interest in most cases.

Common edible and poisonous mushrooms of Ontario, R. E. STONE (*Ontario Dept. Agr. Bul. 397 (1939), pp. 75, figs. 67*).—This handbook gives a key to the species described and illustrated, and includes notes on mushroom growing and on their diseases with control measures.

Investigations on the mycorhizas and root fungi of Juniperus communis [trans. title], D. LIHNELL (*Symb. Bot. Upsal., 3 (1939), No. 3, pp. 141, pls. 3, figs. 19*).—This monograph reviews the literature (about five pages of references), and presents data on the morphology and anatomy of juniper roots, endotrophic mycorhizas and other fungi in these roots, old and new views concerning the phycomycetous mycorhizas, the question of root fungi in general, and the ectotrophic mycorhizas.

Additions to the literature of mycorrhizae: 1938, A. P. KELLEY (*Landenberg, Pa.: Landenberg Lab., [1938], pp. 16*).—This supplements the annotated bibliographies previously noted (E. S. R., 80, p. 167).

The nomenclatorial status of the genus Dimeriella Speg., R. A. TORO (*Jour. Agr. Univ. Puerto Rico [Col. Sta.], 23 (1939), No. 2, pp. 73–89*).—This systematic study of *Dimeriella* (Perisporiaceae), most species of which occur as parasites on leaves or on the mycelium of other fungi, includes a critical analysis of the literature (20 references) and of the present study, from which it is concluded that the genus can be separated into two rather distinct genera, viz, *Lasiostemma* and *Neohochnelia*. Descriptions are given of these two genera and of seven species of the former (six new combinations) and one of the latter. A key to the species is provided.

The synonymy of Fomes fomentarius, M. T. HILBORN and D. H. LINDER. (Maine Expt. Sta. et al.). (*Mycologia, 31 (1939), No. 4, pp. 418, 419*).

Clymenia and Burkillanthus, new genera, also three new species of Pleiospermium (Rutaceae-Aurantioideae), W. T. SWINGLE. (U. S. D. A.). (*Jour. Arnold Arboretum, 20 (1939), No. 2, pp. 250–263, pls. 3*).—This taxonomic contribution is part of an extended study directed toward the preparation of a synopsis of the genera and species of the orange subfamily Aurantioideae.

A taxonomic study of the genus Amelanchier in Minnesota, E. L. NIELSEN. (Univ. Ark.). (*Amer. Midland Nat., 22 (1939), No. 1, pp. 160–206, figs. 16*).—In this paper only those members of the genus occurring in Minnesota and the eastern Great Plains are considered. A key to these species is given, and considerable new taxonomy is involved.

A note concerning the identity of Amelanchier florida Lindley and A. alnifolia Nuttall, E. L. NIELSEN. (Univ. Ark.). (*Amer. Midland Nat., 22 (1939), No. 1, pp. 207, 208*).—The data presented are believed to demonstrate that two distinct species are involved and that synonymy is therefore impossible.

Vegetation on scoria and clay buttes in western North Dakota, W. WHITMAN and H. C. HANSON. (N. Dak. Expt. Sta.). (*Ecology, 20 (1939), No. 3, pp. 455–457*).—This is a critique of a paper by B. I. Judd,[3] a characterization of scoria and clay buttes, and a brief discussion of the authors' studies of plant associations and succession thereon. The determination of the course of plant succession in this region (North Dakota badlands) is said to require long-continued investigations on areas especially reserved for this purpose.

Hayfever plants of the Middle West, N. C. FASSETT, L. MCGARY, and L. F. BATES (*Madison, Wis.: [Authors], 1938, pp. [1]+52, [pls. 2, figs. 131]*).—The plants are described and illustrated, and maps indicate their distribution in Midwestern States.

Poisonous and injurious plants of Los Angeles County (*Los Angeles, Calif.: Los Angeles Co. Livestock Dept., 1938, pp. 27*).—The descriptions and discussions of individual species are grouped under the principal and the minor local plants harmful to livestock. There are also general sections on the prevention, effects, occurrence, and types of poisoning, on plant-induced injuries, and on weed control by use of chemicals.

Value of characters of the undeveloped shoot in identifying plants, H. D. HARRINGTON. (Colo. State Col.). (*Science, 90 (1939), No. 2329, pp. 157, 158*).—This is a discussion of various plant structures which may be used in identifying vegetational material in the absence of the usual stages employed in identification.

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[3] Ecology, 20 (1939), No. 2, pp. 335, 336.

Polyembryony in Myrciaria cauliflora, H. P. TRAUB. (U. S. D. A.). (*Bot. Gaz., 101 (1939), No. 1, pp. 233, 234, fig. 1*).—Polyembryony is shown to be the usual thing in this tree, which, it is suggested, may be a promising new fruit crop for Florida and possibly also for other subtropical regions of continental United States.

The preparation of botanical specimens for the herbarium, I. M. JOHNSTON (*Jamaica Plain, Mass.: Arnold Arboretum, 1939, pp. 33, pls. 5*).—Information is included on the use of herbarium specimens, equipment, pressing and preservation of specimens, general suggestions on their selection, special methods (aquatic flowering plants, ferns, palms, algae, mosses, scale mosses, lichens, and fungi), field records and labels, and the preparation of duplicate sets.

A quadruple stain combination for plant tissues, D. A. JOHANSEN (*Stain Technol., 14 (1939), No. 4, pp. 125–128*).—The new stain technic for paraffin sections involves use of safranin, methyl violet, fast green, and orange G. Differentiation is said to be practically automatic and is controlled by use of special washing solutions. Striking color-contrast effects permit identification of every type of cell structure and cytoplasmic inclusions.

Delafield's hematoxylin and safranin for staining meristematic tissues, N. H. BOKE. (Univ. Calif.). (*Stain Technol., 14 (1939), No. 4, pp. 129–131*).—Paraffin sections from water are stained 2–10 min. in a solution of 2–4 cc. of Delafield's hematoxylin in a Coplin jar of tap water, examining microscopically as staining progresses. When the cell walls become deep purple, transfer through the usual series to equal parts of xylol and absolute alcohol, and then counterstain in 4–6 cc. of a saturated solution of safranin in absolute alcohol added to a Coplin jar of xylol (75 percent) and absolute alcohol (25 percent), which stains the nuclei. Leave the sections in the counterstain at least 2 hr. and rinse in xylol-absolute alcohol (1 : 1) to remove excess safranin. Then transfer to pure xylol and mount in neutral balsam.

Root-tip smear method for difficult material, P. C. BURRELL. (Univ. Calif.). (*Stain Technol., 14 (1939), No. 4, pp. 147–149, fig. 1*).—For studying chromosome number and morphology in root-tip smears the chief objective is to obtain polar views of the metaphase plates. To do this it is recommended that fresh root-tips be cut free-hand into thin cross sections. These are fixed in Belling's iron acetocarmine solution, macerated for 2–5 min. in 50 percent HCl in 95 percent alcohol, and mounted in "Diaphane."

Sumac wax as embedding material in biological technic, J. HSÜ and P. S. TANG (*Stain Technol., 14 (1939), No. 4, p. 151*).—Wax from the seed of the lacquer tree (***Rhus*** sp.) is reported to have proved a satisfactory substitute for paraffin.

Technique for the observation of protoplasmic streaming in sieve tubes, J. SMALL (*New Phytol., 38 (1939), No. 2, pp. 176, 177*).—The author records the several steps in a delicate technic using ophthalmic lances and a ⅙-in. microscope objective by which streaming was successfully observed in the mature sieve tubes of living vegetable marrow stems.

An electric sterilizer for the culture room, E. E. HUBERT (*Science, 90 (1939), No. 2338, pp. 377, 378, fig. 1*).—In place of the usual open gas flame, a special electrical heating unit of nichrome wire coils (diagrammed), operated by a pedal switch and covered by "12 to the inch" mesh screening, is used to sterilize instruments employed in isolating, inoculating, or transferring fungi or bacteria in culture rooms or inoculating chambers.

Cautions in the use of dioxan, H. J. CONN. (N. Y. State Expt. Sta.). (*Stain Technol., 14 (1939), No. 4, p. 152*).—Though the fumes of this reagent are toxic, it is believed not to be dangerous if handled with reasonable precautions.

GENETICS

An introduction to genetics, A. H. Sturtevant and G. W. Beadle (*Philadelphia and London: W. B. Saunders Co., 1939, pp. 391, pls. [4], figs. 126*).—This is a presentation of modern genetic concepts based largely on an appreciation of the role of linkage of genes in more important phenomena of heredity.

Recent advances in plant genetics, F. W. Sansome and J. Philp, rev. by F. W. Sansome (*London: J. & A. Churchill, 1939, 2. ed., rev., pp. XII+412, [pls. 9], figs. [43]*).—The chief advances made in plant genetics during the past 17 yr. are summarized in successive chapters entitled the mechanical aspects of heredity, linkage, the constitution of the gene, variegation and chimaeras, the origin of polyploidy, autopolyploids, allopolyploids, euploids and aneuploids, structural hybridity, and interspecific hybridization. A subject key to the literature supplements an extensive bibliography.

Chromosome structure, L. Geitler (*Chromosomenbau. Berlin: Borntraeger Bros., 1938, pp. VI+190, figs. 69*).—Accounts are given of the morphology and changes observed in chromosomes of different species, especially Diptera (Drosophila).

Symposium on chromosome structure (*Amer. Nat., 73 (1939), No. 747, pp. 289–338, figs. 24*).—The following papers are included: On Coiling in Chromosomes, by B. R. Nebel (N. Y. State Expt. Sta.) (pp. 289–299); The Physicochemical Nature of the Chromosome and the Gene, by C. H. Waddington (pp. 300–314); The Structure of Salivary Gland Chromosomes, by T. S. Painter (pp. 315–330); and Chromosome Structure as Viewed by a Geneticist, by M. Demerec (pp. 331–338).

Chromosome doubling in the cereals, E. Dorsey. (Cornell Univ.). (*Jour. Hered., 30 (1939), No. 9, pp. 393–395, figs. 2*).—Tetraploids of *Triticum monococcum*, *Avena brevis*, *Hordeum distichon*, and *H. vulgare*, produced by the action of colchicine, are described.

Chromosome numbers in root nodules and root tips of certain Leguminosae, L. Wipf. (Wis. Expt. Sta. et al.). (*Bot. Gaz., 101 (1939), No. 1, pp. 51–67, figs. 38*).—Definitely and consistently there was found to be a 2 : 1 chromosome ratio between infected and uninfected cells of the root nodules on the leguminous plants examined, viz, 31 diploid species belonging to *Lathyrus*, *Medicago*, *Melilotus*, *Pisum*, *Trifolium*, and *Vicia*. Infected cells contained the tetraploid number, while uninfected cells in the nodular cortex possessed the diploid number characteristic of the particular species. The bibliography contains 57 references.

Chromosome number in dwarf oats, A. E. Longley and T. R. Stanton. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 8, pp. 733–735, figs. 2*).—Cytological examination of Trelle, Denton, Prolific, Early White, and Early Black dwarf oats revealed some irregularities in meioses, but no chromosomal incompatibilities appeared to exist that might prevent hybridizing Trelle and Denton dwarfs with oats of standard stature for the purpose of transferring their desirable straw characters to commercial varieties.

Apple breeding: Inheritance and statistical studies on the fruits of crossbred seedlings with Antonovka parentage, D. C. Alderman and H. L. Lantz. (Ohio State Univ. and Iowa Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 279–283, figs. 2*).—From data taken during the years 1932–37 on a group of seedlings set out in 1924, the authors conclude that irregular segregation as to fruit size indicates that size is determined by more than one factor and that parental varieties differ greatly in their genetic make-up. Studies of color inheritance indicated that red color is practically homozygous in Jona-

than, King David, Black Oxford, and Ashton. Antonovka apparently carries yellow in a nearly homozygous state, and yellow is generally recessive to red. The lack of distinct groups of segregates as to quality suggested that quality is controlled by a complex of several genes. Season of maturity also appeared to be explainable only on a multiple-factor basis.

A note on natural and colchicine-induced polyploidy in peaches, H. Dermen and D. H. Scott. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), p. 299*).—Two instances of polyploidy are reported, (1) a triploid, open-pollinated seedling of Golden Jubilee, and (2) a probable sectorial tetraploid, induced by complete immersion of seedlings in 1 percent colchicine for 4 hr. The Golden Jubilee seedling was exposed to heat and cold so timed that the embryo sac development was believed complete and zygote development in progress. Stomata lengths in the triploid seedlings, the tetraploid sector, and a diploid sector were $45.70\mu \pm 0.32$, $50.70\mu \pm 0.39$, and $36.85\mu \pm 0.28$, respectively.

Colchicine-induced tetraploid and 16-ploid strawberries, H. Dermen and G. M. Darrow. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 300, 301*).—Stating that the diploid number of chromosomes in the strawberry is $2n=14$ and that the highest polyploid number is octoploid, $8n=56$, the authors report that treatment of from 1- to 3-day-old seedlings of the octoploid Dorsett with 1 percent colchicine for 5 hr. resulted in one plant that apparently was entirely 16-ploid and two others that were mixed, having both $8n$ and $16n$ root tips. Continuance of the work yielded six runner plants that apparently were 16-ploid and two plants of $8n$ and $16n$ tissues. Examination of the root tips of seedlings produced from the seed of three wholly or partially $4n$ *Fragaria vesca* plants showed one with $3n$ chromosomes. At the time of writing the paper, the authors had strawberry plants at Beltsville, Md., with $2n$, $3n$, $4n$, $5n$, $6n$, $8n$, and $16n$ chromosome numbers.

Polyploidy in lettuce induced by colchicine, R. C. Thompson and W. F. Kosar. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 641–644*).—Using a strain of Grand Rapids lettuce which had been inbred over a long period and which was therefore highly homozygous, the authors succeeded by colchicine treatment of the epicotyls and cotyledons of seedlings in developing tetraploids. These tetraploids were highly self-sterile and passed this characteristic to their progeny. However, there was considerable variation, suggesting the possibility of selecting fairly fertile lines. In one F_1 population there were three completely self-sterile, very smooth-leaved plants nearly free of the frilled-leaf characteristic of the normal diploids. The individual plants varied greatly in growth rate and time of seed stem development. Numerous other variations were noted. Summing up, the authors state that the colchicine treatment of embryos and small seedlings appears to offer a means of obtaining lettuce polyploids. The treatment of older tissues was not found as effective. Since the tetraploids were much larger, the technic has possibilities in increasing the size of dwarf segregates possessing desirable heading or other characteristics.

The needs of superior individuals as guides to group ascendance: An experimental approach to the problem of "optimum environment," W. F. Dove. (Maine Expt. Sta.). (*Jour. Hered., 30 (1939), No. 4, pp. 157–163, figs. 2*).—A discussion is given of differences in the abilities of individuals and races to satisfy inherent needs.

Studies on Africander cattle, with special reference to coat colour inheritance, F. N. Bonsma (*Univ. Pretoria Pubs., ser. 1, No. 39 (1938), pp. 45, figs. 14*).—An analysis of color inheritance in Africander cattle based on pedigrees and color of the cattle produced in many private herds suggested that

yellow is recessive to red, but that three pairs of allels with three pairs of modifying recessive genes seem necessary for the full expression of cream.

Ankylosis and crooked fore-legs—a new semilethal hereditary factor in Friesian cattle [trans. title], A. B. Ruzhevskii (Ruzhevsky) (*Biol. Zhur., 7 (1938), No. 3, pp. 547–558, figs. 8; Eng. abs., pp. 557, 558*).—Crooked forelegs and ankylosis, a malformation in purebred Friesian cattle, was found to be inherited as a recessive to the normal.

A genetic history of Poland-China swine.—I, Early breed history: The "hot blood" versus the "big type"; II, "Founders of the breed," prominent individuals, length of generation, J. L. Lush and A. L. Anderson. (Iowa Expt. Sta.). (*Jour. Hered., 30 (1939), Nos. 4, pp. 149–156, figs. 5; 5, pp. 219–224, fig. 1*).—Study of the amounts of inbreeding and relationship by the sampling method in Poland Chinas showed that only about 10 percent of the heterozygosis in the foundation animals was eliminated during 44 yr. of pure breeding. There was some but only a slight tendency to separate into families. Three ancestors each contributed about 12 percent of the genes of the breed. The general method of breeding followed was the selection and extensive use of the sons and daughters and grandsons and granddaughters of the famous sires and dams, with some shifts from one animal to others not very closely related. The average interval between generations was about 2.5 yr.

Wattled pigs in Panama, W. Allan (*Jour. Hered., 30 (1939), No. 5, pp. 216–218, figs. 2*).—Attention is called to the occurrence of wattled pigs in Panama, and a review is given of wattles from other domestic animals.

The Norwegian platinum fox—a coat color mutation having great economic value, O. L. Mohr and P. Tuff (*Jour. Hered., 30 (1939), No. 6, pp. 226–234, figs. 7*).—An autosomal dominant mutation in silver foxes designated as platinum arose in 1933. All platinum foxes on which breeding histories were obtained have evidently been heterozygous. Light and dark platinum mutations have been noted from other localities, but their genotype has not been determined.

Mouse-breeding made easy, A. C. Hagedoorn, V. LaBrand, and A. L. Hagedoorn (*Jour. Hered., 30 (1939), No. 4, pp. 146–148, fig. 1*).—Methods of breeding and of rearing mice in enamelware bowls are described.

A second independent occurrence of the curly$_2$ mutation in the rat, H. D. King and L. F. Whitney (*Jour. Hered., 30 (1939), No. 5, pp. 211, 212*).—F_1 rats produced by crossing a new type of woolly haired rats with rats homozygous for curly, previously reported by King (E. S. R., 68, p. 747), were all curly. The progeny from these F_1s mated to normals were both curly and normal, indicating the action of two different genetic factors. F_1s produced by crossing the woolly rats with curly$_2$ rats (E. S. R., 75, p. 324) when mated with normals or inbred animals produced only curlys, making evident the fact that the new type woolly was a recurrence of the curly$_2$ mutation.

A linkage between naked and caracul in the house mouse, C. B. Cooper (*Jour. Hered., 30 (1939), No. 5, p. 212*).—Among 335 backcross progeny involving the genes karakul (E. S. R., 78, p. 770) and naked there was found only 1.8 percent crossing over, thus showing a very close linkage between these genes.

Postjuvenal nude in the deer-mouse, F. H. Clark (*Jour. Hered., 30 (1939), No. 5, pp. 213–215, figs. 2*).—A condition designated as postjuvenal nude is described in *Peromyscus maniculatus*. The juvenal coat was completely shed at from 2 to 3 weeks of age, and the nude condition continued to about 50 days of age when a new growth of hair appeared. Matings with normal and hairless mice showed the condition to be due to a recessive gene different from that causing ordinary hairlessness.

A study of the temperament of wild rats and of their F_1 hybrids [trans. title], M. P. KOL'TSOVA (KOLTZOVA) (*Biol. Zhur., 7 (1938), No. 3, pp. 559–570; Eng. abs., pp. 569, 570*).—Wild rats in captivity were found to run from 5.9 to 17.5 km. during 24 hr. A stock of laboratory rats selected over a period of 13 yr. for little activity ran an average of 1.22 km. in the same length of time. A laboratory stock selected for activity ran an average of 4.7 km. In general, the activity of hybrids was intermediate between the activity of the parents. However, hybrids between the inactive stock and the wild stock were about twice as active as hybrids between the more active laboratory stock and wild rats.

The age of rats at sexual maturity as determined by their genetic constitution, C. T. BLUNN. (Univ. Calif.). (*Anat. Rec., 74 (1939), No. 2, pp. 199–213*).—Two strains of rats were found to show significant differences in the mean age of sexual maturity and the mean rate of growth from weaning to sexual maturity. Reciprocal crosses were early maturing and rapid growing, like the early-maturing parent. Backcross populations showed some segregation according to rate of maturity and rapidity of growth. Genetic composition was found to be a more important indication of the age at which animals became sexually mature than size of litter. When comparing maturity of strains of rats from different laboratories, consideration should be given to both environmental conditions and to the source of the strains under consideration.

Spike blade—a heritable single comb variation in the fowl, D. C. WARREN. (Kans. Expt. Sta.). (*Jour. Hered., 30 (1939), No. 6, pp. 257–260, fig. 1*).—A modification in the portion of the comb extending back of the attachment and designated as spike blade was observed in Single Comb Rhode Island Reds. The matings of spike-blade and normal parents produced 91 normal, 13 intermediate, and 48 spike-blade daughters and 108 normal, 6 intermediate, and 10 spike-blade sons. F_1 normals backcrossed to spike-blade birds produced 51 normal, 8 intermediate, and 53 spike-blade daughters and 63 normal, 9 intermediate, and 40 spike-blade sons. Larger percentages of spike-blade progeny occurred among ♀♀ in all types of matings than among ♂♂. In selected matings of spike-blade parents, the ♀ progeny were almost entirely spike-bladed, whereas varying percentages of normals appeared among the ♂♂. The author concludes that the responsible gene is recessive and not sex-linked, but the production of many normals in inter se matings of spike-bladed parents was difficult to explain.

Direct control of avian color pattern by the pigmentoblasts, C. H. DANFORTH (*Jour. Hered., 30 (1939), No. 4, pp. 173–176, fig. 1*).—Citations from skin-grafting experiments with birds point toward the conclusion that the pigmentation of feathers is mainly dependent on highly autonomous migratory pigmentoblasts which determine not only color but, through some capacity to orient themselves, pattern as well.

The inheritance of silky plumage in the domestic pigeon, L. J. COLE and W. F. HOLLANDER. (Wis. Expt. Sta.). (*Jour. Hered., 30 (1939), No. 5, pp. 197–201, figs. 3*).—Silky plumage (feathers failing to web normally) in the pigeon was determined in appropriate crosses to be due to the action of a single autosomal dominant gene. Extreme silkies were *LL*, moderate silkies were *Ll*, and normals were *ll*. In substantiation of this hypothesis, which differs from that of Steele (E. S. R., 55, p. 327), matings of normal parents produced only normals. Extreme silkies × normals produced only silkies. Moderate silkies × normals produced 146 silkies and 159 normals. Both moderate silky parents produced 80 silkies and 24 normals. Silky combined with several known factors and did not seem to be linked with the genes for black or pure white.

The physiology and pharmacology of the pituitary body, II, H. B. van Dyke (*Chicago: Univ. Chicago Press, 1939, vol. 2, pp. XIV+402, [pl. 1], figs. [27]*).—A critical digest of experimental and clinical literature that has appeared since volume 1 was published (E. S. R., 77, p. 470).

A comparison of the guinea pig and chick thyroid in the assay of the thyrotropic hormone, A. J. Bergman and C. W. Turner. (Mo. Expt. Sta.). (*Endocrinology, 24 (1939), No. 5, pp. 656–664, figs. 2*).—Assays of anterior-pituitary extracts for thyrotropic hormone were made by the use of immature guinea pigs and chicks. The ♂ chick unit of thyrotropic hormone was found to be equivalent to about one-fourth of a guinea pig unit as defined.

The thyrotropic hormone in the pituitary of the albino rat during growth, pregnancy, and lactation, C. W. Turner and P. T. Cupps. (Mo. Expt. Sta.). (*Endocrinology, 24 (1939), No. 5, pp. 650–655, figs. 4*).—Analyses by the chick method, noted above, of pituitaries from rats showed that during the period of rapid growth there was a higher concentration of the thyrotropic hormone than at other times. ♂♂ always showed more thyrotropic hormone per gland than ♀♀. The amount of the hormone in the gland showed definite increases during the latter part of gestation and during the initiation of lactation.

Changes in electrical potential during the estrous cycle of the rat.—II, Partial and complete hypophysectomy and pituitary replacement therapy, P. V. Rogers (*Endocrinology, 22 (1938), No. 1, pp. 35–40, figs. 4*).—Continuing this series,[a] it was found that ovariectomized and hypophysectomized rats reacted similarly as to differences in electric potential between the symphysis pubis and the vaginal canal as a result of theelin administration. Hypophysectomized animals brought into oestrus with prephysin remained in oestrus indefinitely.

Changes in electrical potential during oestrous cycle of the rat.—III, Vaginal oestrous, P. V. Rogers (*Soc. Expt. Biol. and Med. Proc., 37 (1937), No. 1, pp. 212, 213*).—It was found, in continuation of the study noted above, that cornification of the vagina alone would not produce the changes in electrical potential characteristic of full oestrus in the uterus.

The effects of delayed fertilization on the development of the guinea pig ovum, R. J. Blandau and W. C. Young (*Amer. Jour. Anat., 64 (1939), No. 2, pp. 303–329, pls. 5, figs. 2*).—To study the effects of delayed fertilization on the development of the guinea pig, 462 ♀♀ were artificially inseminated during the heat period or 18, 24, 30, 36, and 42 hr. after the beginning of heat as ascertained by the copulatory response observed at half-hour intervals. As the time of insemination was delayed, the percentage of normal pregnancies and the size of the litter decreased and the abnormal pregnancies terminated by death of the embryo and abortion increased. With ovulation estimated as occurring 10 hr. after the onset of heat, no normal development followed inseminations more than 20 hr. after ovulation. Histological examination of the normal and abnormal embryos and ova aged before fertilization showed gross structural abnormalities in the aged ova and embryos therefrom. Normal corpora lutea were found in animals with retarded embryos. Delayed fertilization of the ova was responsible for most pregnancies ended before the twenty-seventh day of gestation, but after the fifty-fifth day abortions were as common in the control group as in the experimental animals.

The masculinizing effect of some gonadotropic hormones on pullets compared with spontaneous ovariogenic virilism in hens, U. U. Uotila (*Anat. Rec., 74 (1939), No. 2, pp. 165–187, pls. 3, figs. 4*).—Study was made of the

[a] Amer. Jour. Physiol., 121 (1938), No. 3, pp. 565–573, figs. 4.

effects of 20 daily injections of follicle-stimulating hormone, pregnant-mare serum, androsterone, and oestradiol on the development of the ovaries, oviducts, adrenals, thyroids, and combs of 24-day-old pullets. These results showed that the follicle-stimulating hormone and the luteinizing hormones produced masculinizing overgrowths. Pregnant-mare serum produced some medullary cord and interstitial cell hypertrophy, accompanied by slight masculinization, but the effect was more pronounced in large doses, which increased the weight of the oviduct. Androsterone caused masculinization of the head furnishings and atrophy of the ovaries, whereas oestrin inhibited comb growth and caused ovarian atrophy.

Influence of thyroid on egg production, C. F. WINCHESTER. (Mo. Expt. Sta.). (*Endocrinology, 24 (1939), No. 5, pp. 697–701*).—Thyroidectomy of seven White Leghorn hens resulted in decreased production from 3.77±0.39 to 0.42±0.18 eggs per week. Production was increased to from 40 to 60 percent of normal by thyroxine administration to thyroidectomized birds.

The action of colchicine upon the 48-hour chick embryo, G. H. PAFF (*Amer. Jour. Anat., 64 (1939), No. 2, pp. 331–349, pls. 4*).—Study was made of the effect on 48-hr. chick embryos of repeated doses of 0.00075 mg. of colchicine. Studies of the embryos after fixation showed that small doses of colchicine resulted in overproduction of cells and failed to arrest all of them in mitosis. It seems that in rapidly dividing cells colchicine may stimulate as well as inhibit development.

Hermaphrodism in milk goats, O. N. EATON and V. L. SIMMONS. (U. S. D. A.). (*Jour. Hered., 30 (1939), No. 6, pp. 261–266, figs. 2*).—An analysis of the production of hermaphrodites in the Beltsville herd from 1925 to 1938 showed 11.1 percent of the Saanens and 6 percent of the Toggenburgs born to be hermaphrodites. The condition seems to be inherited and due to a single recessive factor. Inter se matings of carriers (heterozygotes) produced 20.2 and 22.1 percent of hermaphrodites among the progeny of the two breeds. Data are given on the multiple births, birth weights, mortality, age of the dams, sex ratios, and hermaphroditism in the different groups. There was no relation between type of birth and hermaphroditism.

Artificial insemination, A. D. BUCHANAN SMITH (*Highland and Agr. Soc. Scot. Trans., 5. ser., 51 (1939), pp. 24–38*).—A review of the pros and cons and successes obtained in the practice of artificial insemination with various classes of livestock.

FIELD CROPS

[**Agronomic research in the Southern States**] (*Assoc. South. Agr. Workers Proc., 40 (1939), pp. 30–35, 53–69, 117, 118, 135–140, 150–152*).—The several papers dealing with agronomic problems and presented at the convention of the Association of Southern Agricultural Workers at New Orleans, La., February 1–3, 1939, reported in abstract form, included Chemistry and Growth of the Cotton Plant as Affected by Sorghum Residues and Nitrogen Supplements, by J. E. Adams, L. E. Hessler, and D. R. Ergle (p. 30), The Magnesium Content of Fertilizers, 1850 to 1937, by A. L. Mehring (pp. 32, 33), The Influence of Fertilizers on Crop Yields in the United States by Decades, by W. H. Ross and L. S. Deming (p. 33), Soil Moisture Factors, Run-Off, and Erosion From Piedmont Soils, by T. C. Peele and E. E. Latham (p. 58), Dispersion of Lateritic Soils and the Effect of Organic Matter on Mechanical Analysis, by O. W. Beale (pp. 59, 60), The Problem on Maintaining Identity and Pure Seed of Southern Oat Varieties, by T. R. Stanton (p. 61), Some Preliminary Notes on a Skip Correction Study in Louisiana, by J. R. Cotton (pp. 66, 67), and Some

Recent Investigations on the Control of Sweet Potato Diseases, by L. L. Harter (pp. 138, 139) (all U. S. D. A.); Correlation Between Soil Nutrient Levels and Responses of Vegetable Crops to Fertilizer Treatments, by H. H. Zimmerley (p. 31) (Va. Truck Expt. Sta.); Potash for Cotton, by N. J. Volk (p. 32) (Ala. Sta.); The Value of Rapid Chemical Tests in Determining Fertilizer Needs, by W. R. Paden (pp. 33–35), The Importance of Potash to Southern Agriculture, by G. B. Killinger (p. 56), The Influence of Cropping Practices on Some Physical and Chemical Properties of Soil, by F. Moser (p. 60), and The Importance of Barley, Grain Sorghums, and Soybeans to the Southeastern States, by G. B. Killinger (p. 64) (all S. C. Sta.); The Eradication of Nut Grass, *Cyperus rotundus* L., From Norfolk Sandy Loam Soils by the Tillage Method, by E. V. Smith and E. L. Mayton (pp. 53, 54), Germination of Untreated *Crotalaria spectabilis* Seed in Soil Supplied With Varied Amounts of Water, and Effects on Germination of Delay in Supplying Moisture, by J. F. Duggar (p. 54), and Variations in Relation to Cotton Wilt—Abstract of Results Obtained 1936–1938, by H. B. Tisdale (p. 67) (all Ala. Polytech. Inst.); The Effect of Sources of Nitrogen and Lime on the Response of Cotton to Sources of Phosphorus (pp. 54, 55) and The Removal of Nitrogen From Commercial Fertilizer and Green Manure Crops of the Southeast and Its Probable Influence Upon the Base Supply of the Soil (p. 55), both by W. B. Andrews and R. Cowart, The Response of Vetch and Cotton to Sodium, by W. B. Andrews and R. Coleman (p. 61), and Production of Sweet Potatoes for Starch, by W. S. Anderson (p. 140) (all Miss. Sta.); Potassium and Potassium Fixation in Louisiana Soils, by M. B. Sturgis and J. R. Moore (pp. 56, 57), Effect of Inbreeding Upland Cotton for Ten Years, by H. B. Brown (p. 65), and Further Studies and Technic in Sweet Potato Breeding in Louisiana, by J. C. Miller (pp. 136, 137) (all La. Sta.); The Relation of Fertilizer Use to Crop Production, by H. R. Smalley (pp. 57, 58); Nitrogen Removed by Drainage and Cropping From Lysimeters as Affected by Kind of Vegetative Cover, by P. E. Karraker (pp. 58, 59) (Ky. Sta.); The Influence of Subsoiling and Organic Matter on Eroded Lufkin Soils, by D. W. Thorne (p. 59) (Tex. A. and M. Col.); Time and Rate of Seeding Soybeans and Effect of Time of Harvesting on Composition and Acre Yields, by S. V. Stacy, O. E. Sell, and S. J. Hadden (pp. 62, 63), and Technique in Colchicine Treatment of Pasture Plants and Seeds, by O. E. Sell (pp. 63, 64) (both Ga. Sta.); Methods of Flue Curing Tobacco in Relation to Quality, by E. G. Moss (p. 64) (U. S. D. A. and N. C. Sta.); Studies With Recently Developed Cotton Strains (pp. 65, 66) and Hopi Cotton and a Note on Its Phylogenetic Relationship With the Upland Species (pp. 68, 69), both by J. W. Neely (both U. S. D. A. and Miss. Sta.); Fertilizers in Relation to Incidence of Wilt as Affecting a Resistant and a Susceptible Variety, by J. B. Dick (p. 68) (U. S. D. A. and Ala. Polytech. Inst.); Relationship of Deficiencies in Lime and Mineral Plant Food Elements to the Establishment of Pastures, by L. A. Bradford (pp. 117, 118) (Univ. Ky.); The Maintenance of Seed Stock of the Porto Rico Sweet Potato, by J. G. Richard (pp. 135, 136) (La. State Univ.); Sweet Potatoes—A Summary of Results of Recent Fertilizer Experiments, by R. Schmidt (p. 137) (N. C. Sta.); Curing Temperature in Relation to Storage Quality of Three Varieties of Sweet Potatoes, by H. B. Cordner (p. 139), and Fertilizer Trials With Irish Potatoes in Oklahoma, by E. F. Burk and H. B. Cordner (pp. 150, 151) (both Okla. Sta.); and Temperature and Other Factors in Relation to Germination of Potato Sets and Tubers, by H. B. Cordner (pp. 151, 152) (Okla. A. and M. Col.).

[Field crops work in Arizona]. (Partly coop. U. S. D. A.). (*Arizona Sta. Rpt. 1938, pp. 26–32, 37–41, 61–65, 66, 67, figs. 2*).—Progress results are reported

from experimentation (E. S. R., 79, p. 469) at the station and substations, including variety tests with wheat, barley, oats, grain sorghum, sorgo, and soybeans; comparison of open-pollinated and hybrid corn; planting tests with grain sorghum varieties, breeding work with barley, alfalfa, cotton, and wheat; studies of factors, especially crop sequences, climate, soil moisture, and spacing, influencing maturity and length of cotton fibers; study of seed setting in alfalfa; sugar beet seed production studies, including varieties and effects of planting dates, nitrogen supply, thinning, and topping; the effect of irrigation on the amount of foliage produced for pasturing barley and oats; range studies concerned with seasonal utilization and forage requirements on range vegetation by rodents, and fertilizer tests; life history and reproduction of burroweed; relation of climatic conditions to vegetation; and control of bindweed, horsenettle, and nutgrass by different treatments.

[Farm crops studies in Mississippi] (*Miss. Farm Res. [Mississippi Sta.], 2 (1939), No 9, pp. 1, 2–6, 7, 8, figs. 9*).—This number contains the following: Limestone, Dolomite Available, by W. B. Andrews (p. 1); Dallis Seeding Not Difficult by Use of Mulch, by H. W. Bennett (pp. 1, 8); Phosphorus From Previous Crop Aids Winter Legumes, by J. L. Anthony and J. Pitner (pp. 1, 8); Care of Cotton by Grower Contributes to Premium Grade, by T. N. Jones (pp. 1, 2); More Oats Suggested, by C. Dorman (pp. 1, 8); Truck Crops Unit Reports on Seeding, Fertilizing Peas, by J. A. Campbell and L. R. Farish (p. 2); Terruf, Ferguson 922, Nortex, Appler, Hastings, Bayliss Lead in Oat Variety Tests by Hill Stations of Mississippi, by J. F. O'Kelly (p. 2); Small Grain Variety Tests (p. 2) and Small Grain Production (pp. 3–6), both by R. Kuykendall; Fertilized Oats Justify Expense by Added Yield, by J. L. Anthony and J. Pitner (p. 7); and Hemp and Ramie Successfully Grown at Poplarville, by J. C. Robert (p. 7).

[Field crops and pasture research in New Hampshire] (*New Hampshire Sta. Bul. 313 (1939), pp. 6, 7, 9–12, 14, 17, 18, 19*).—Agronomic experiments (E. S. R., 79, p. 472) reported on briefly and variously participated in by M. F. Abell, G. P. Percival, P. N. Scripture, J. L. Haddock, P. T. Blood, L. J. Higgins, S. Dunn, and O. R. Butler included variety trials with potatoes, silage corn, and soybeans: tests with legumes and a dairy farm rotation on neglected hay lands: crop responses in a 3-yr. fertilized rotation of potatoes, oats, and hay; fertilizer placement, cooking quality, and storage experiments with potatoes; a fertilizer experiment with clover-timothy hay in the Connecticut Valley; a top dressing experiment on old pastures: a comparative study of pasture grasses and legumes pure and in mixtures; and control of brush in pastures.

[Agronomic work in New Jersey] (*New Jersey Stas. Rpt. 1938, pp. 20–24, 89*).—Field crops work (E. S. R., 79, p. 322) again reported on included breeding studies with corn, rye, alfalfa, oats, and white clover; variety tests with corn (and hybrids), oats, barley, soybeans, and white clover strains; tests of the use of winter barley and soybeans as combination crops in 1 yr. in alternation with cultivated crops; planting of wheat and winter vetch in September to be harvested in May for molasses silage; fertilizer tests with potatoes; cultural trials with seed flax; comparison of the lime-minerals-clover and the lime-minerals-nitrogen systems of pasture treatment; and experiments on establishing and maintaining fine turf, including studies on control of crabgrass and similar weeds.

An outline of British crop husbandry, H. G. Sanders (*Cambridge, Eng.: Univ. Press; New York: Macmillan Co., 1939, pp. VIII+348, pls. 6*).—Designed for farmers and agricultural students, this volume describes the general principles underlying the practices of the main operations in crop production in Great Britain, including rotations, fertilizing, weed control, tillage and seedbed

preparation, choice and treatment of seed, planting, cultivation and harvesting of cereals, roots, and potatoes, and production costs.

Dry-farming investigations at the Mosquero, N. M., experimental field, J. Carter, Jr. (*New Mexico Sta. Bul. 265 (1939), pp. 15, figs. 9*).—Experiments with field crops were carried on, 1927–38, at an elevation of 5,700 ft. in a rather cool climate, with an annual average of 16.25 in. precipitation (13.39 in. between April 1 and September 30) and 162 frost-free days.

Varietal leaders included Kanred, Blackhull, and Turkey winter wheat; Kalo and Dwarf Yellow milo, grain sorghums; Leoti Red and Early Sumac sorgo; Siberian millet; Union County White and Hays Golden corn; Bayo and Pinto field beans; and blue grama, smooth bromegrass, and crested wheatgrass.

Summer fallowing has not resulted in increased wheat yields, but fallowed land has produced a crop oftener than by continuous cropping. Fallowing is not advisable where wind erosion is an important factor. The high winds frequent in fall, winter, and early spring cause much damage in soil blowing after the bean harvest unless the soil surface is protected by roughening. Millets have been seeded late in July as an emergency crop after hailstorms, crop failures, or for a late hay crop.

Weather and plant-development data as determinants of grazing periods on mountain range, D. F. Costello and R. Price (*U. S. Dept. Agr., Tech. Bul. 686 (1939), pp. 31, figs. 6*).—Measurements and observations of range-plant development and weather were made, 1925–34, within three mountain vegetative zones in Ephraim Canyon, central Utah. Rates of growth and development of range plants were observed to vary under varying weather conditions, for each individual species both within and between each class of vegetation, for different altitudes, and from year to year. The rate of development is delayed from 10 to 14 days for each 1,000 ft. of elevation. Temperature influence is evident in all stages of development, especially during the early growth stages. During the later growth stages precipitation, soil moisture, and evaporation assume importance and may become limiting factors. High correlation found to exist between date of snow melt and subsequent growth and development of the plants made it possible to predict developmental stages of important forage plants with reasonable accuracy more than 3 mo. in advance. The studies also stressed the importance of basing the determination of grazing periods on the growth and development of important key forage plants and so controlling the distribution of livestock as to protect each elevational zone until the key forage plants have actually reached range readiness. The opening date of grazing should be varied each year to correspond to the yearly development of the important forage plants by use of the snow-melt plant-development relationship. Where it is impracticable to vary opening dates every year grazing dates should be established late enough to prevent premature grazing in many years.

[**Pasture and range in Nevada**]. (Partly coop. U. S. D. A.). (*Nevada Sta. Rpt. 1938, pp. 30, 31*).—Pasture improvement and studies of invasion of ranges by annual grasses are reviewed briefly.

Fodder conservation, with special reference to grass drying, E. J. Roberts (*[Gt. Brit.] Agr. Res. Council Rpt. Ser. No. 5 (1939), pp. [5]+137, figs. 2*).—The report, prepared for the Committee on the Preservation of Grass and Other Fodder Crops, treats of grass drying in Great Britain and other countries, machines and equipment, production cost and feeding value of dried grass, partial field drying, drying compared with other methods of conserving grass, and the artificial drying of potatoes, root crops, and sugar beet tops. Ninety-three references are listed.

A bibliography of cerealiana, C. H. Briggs (*Minneapolis, Minn.: Miller Pub. Co., [1938], pp. 59*).—"A list of books and pamphlets on cereal production and marketing, milling and baking, and insect and fungus infestations of cereals and cereal products, including publications of State, provincial, and national agricultural experiment stations and boards of agriculture."

The differential response of alfalfa varieties to time of cutting, H. M. Tysdal and T. A. Kiesselbach. (U. S. D. A. and Nebr. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 6, pp. 513–519*).—The response of Ladak to different times of cutting has been so great that it might be made the lowest or highest yielding in a series of standard varieties through change in the time of cutting. When the first cutting was late and subsequent cuttings had a relatively long time to develop, Ladak outyielded Nebraska Common and Hardistan. When cut unusually early it was significantly below Grimm in yield in all comparisons and equally as low as, or lower than, the other two alfalfas. Nebraska Common did not differ much in yield from Grimm under any cutting treatment and Hardistan reacted similarly to Grimm, although yielding less under certain treatments, as with early cutting. Hardistan and Ladak suffered less in loss of stand in frequent cutting treatments. Material differences in time or amount of blooming did not occur in the first cutting, yet Grimm and Common bloomed earlier and more profusely in the second and third cuttings. Ladak evidently should be allowed to grow somewhat longer for the first cutting and between subsequent cuttings than is usual with Grimm or Common for optimum production either in variety tests or on the farm.

1938 report of the uniform alfalfa nurseries, H. L. Westover and H. M. Tysdal. (Coop. 39 expt. stas.). (*U. S. Dept. Agr., Bur. Plant Indus., 1939, pp. [1]+49, fig. 1*).—Detailed data on 12 different characters of 85 alfalfa strains (E. S. R., 81, p. 204) are variously reported from stations in 39 States and 2 Canadian Provinces. The characters included vigor, fineness of stems, recovery after cutting, stand survival, seed and forage yields, and resistance to leafhopper, leaf spot, mildew, black stem, and bacterial wilt. Compared with certain of the newer wilt-resistant varieties, Hardistan, typical of the Turkistan group, is relatively low in leaf spot resistance and also somewhat low in seed and forage yield. The major improvement in strains evidently occurred in increased resistance to bacterial wilt and greater seed productivity.

The trailing wild bean in southern Illinois, C. J. Badger. (Univ. Ill.). (*Ill. State Acad. Sci. Trans., 31 (1938), No. 2, p. 62*).—The 1,550 lb. of hay per acre produced by trailing wild bean (E. S. R., 81, p. 371) was somewhat comparable to alfalfa hay in chemical composition.

Bibliography on red clover (Trifolium pratense) (*Imp. Bur. Pastures and Forage Crops [Aberystwyth], Mimeog. Pub. 4 (1939), pp. [2]+60*)—The 476 classified references are supplemented by an author index.

Bibliography on white clover (Trifolium repens) (*Imp. Bur. Pastures and Forage Crops [Aberystwyth], Mimeog. Pub. 5 (1939), pp. [2]+30*).—The list includes 189 classified references and an author index.

The origin of Indian corn and its relatives, P. C. Mangelsdorf and R. G. Reeves (*Texas Sta. Bul. 574 (1939), pp. 315, figs. 95*).—The monograph, which should be consulted in the original, treats successively of the botanical relationships of corn and previous evidence and theories on its origin; new evidence from cytogenetic studies of the authors and others; the origin of teosinte, corn, and *Tripsacum*; the theoretic phylogeny of the American Maydeae and their relationship to the Andropogoneae; and corn in relation to culture and civilization. The bibliography includes 371 titles.

The genetic and cytological research on corn and its relatives, resulting in a complete revision of theories on the origin of corn, indicates that teosinte (*Euchlaena*), formerly considered the progenitor of corn, is the product of a natural hybrid of corn and *Tripsacum*. The archaeological and historical evidence suggests that corn as a domestic plant had its origin as a mutation from a wild form of pod corn in South America. The hybridization of corn and Tripsacum in Central America to produce *Euchlaena* has also resulted in new types of corn. Most North American corn varieties, it is believed, carry some *Tripsacum* genes in their germ plasm.

A foliar diagnosis study of the effect of three nitrogen carriers on the nutrition of Zea mays, W. THOMAS and W. B. MACK. (Pa. Expt. Sta.). (*Jour. Agr. Res.* [U. S.], *59* (*1939*), *No. 4, pp. 303–313, figs. 5*).—Corn growing on the Jordan fertility plats (E. S. R., 81, p. 365) treated with manure+lime and with complete fertilizer carrying nitrogen as dried blood and as sodium nitrate, both without lime, with the same carriers of phosphorus and potassium was examined by the method of foliar diagnosis.

The absorption and utilization of nitrogen and phosphorus was best and at a higher plane of nutrition with manure+lime and least and at a low level in the dried blood mixture. Sodium nitrate inhibited the absorption of potassium more than did dried blood but less than lime, an influence found in the soil and not in the plant. Effects of the several treatments on intensities of nutrition and on the N–P_2O_5–K_2O equilibrium during the growth cycle are described, and the latter magnitudes are shown in trilinear coordinate diagrams. The positions of the mean values during the growth cycle of the NPK-units for a particular treatment in relation to that of the optimum treatment showed a definite correlation with yields.

Corn investigations in New Mexico, G. STATEN, D. R. BURNHAM, and J. CARTER, JR. (Partly coop. U. S. D. A.). (*New Mexico Sta. Bul. 260* (*1939*), *pp. 22, figs. 4*).—Leading corn varieties in extended tests have included the white Mexican June and the yellow Golden June and Mexican June × Reid at the station, Union County White and Hays Golden at Clayton, Minnesota No. 13 and Swadley at Mosquero, White Flint at Capulin, and Surcropper, Mexican June, Reese Drought Resister, and Colby Bloody Butcher at Tucumcari.

Mexican June corn when grown for silage apparently competes well with sorghums in the southern irrigated valleys of New Mexico and has equaled the desirable late sorghums and surpassed the earlier ones. However, the earlier sorghums can be planted much later than corn and mature before frost. Corn compared unfavorably with the better grain sorghums for grain and was much lower in fodder yield than the sorgos in prolonged tests at Tucumcari. Sunrise kafir, a dual-purpose sorghum with fine, leafy, sweet stalks, surpassed corn in both grain and fodder yields. In favorable seasons at Tucumcari corn most nearly approached the sorghums in yield, while in drought years when corn virtually failed sorghums often produced light to fair yields.

Cultural practices, precipitation and other environmental factors, and insect pests are mentioned briefly.

Weather in relation to yield of American-Egyptian cotton in Arizona, H. J. FULTON. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, *31* (*1939*), *No. 8, pp. 737–740, figs. 2*).—Data presented show that early-killing frost in the fall and high evaporation during the flowering period are two weather factors which appear to limit yields of American-Egyptian cotton in Arizona. Increased irrigation during the critical flowering period, within reasonable limits, is suggested as a means of counteracting effects associated with high evaporation.

Utilization of cotton and other materials in fertilizer bags, R. J. CHEATHAM nd R. B. EVANS (*U. S. Dept. Agr., Bur. Agr. Econ., 1939, pp. [1]+25, figs. 3*).—nformation on the types of bags used in the fertilizer industry, i. e., cotton, lined nd unlined burlap, and paper, and on demand, cost, and other factors influencing he use of cotton fertilizer bags was derived from a survey of fertilizer manuacturers in 1937 and from other sources. In 1937, 82 percent of all fertilizer onnage was packaged in burlap bags, 12 in cotton, and 6 percent in paper, hile a survey made in 1927-28 showed 98 percent bagged in burlap, 2 in cotton, nd none in paper. Cotton bags were used more extensively than all other ypes combined in Mississippi, Arkansas, Louisiana, and Texas and extensively in labama, Tennessee, Georgia, and Virginia. Paper bags were used most exensively in the Pacific Northwest and in New York, New Jersey, and Wisconsin, nd burlap bags were used generally elsewhere.

Sorghums in Colorado, J. F. BRANDON, J. J. CURTIS, and D. W. ROBERTSON. Coop. U. S. D. A.). (*Colorado Sta. Bul. 449 (1938), pp. 61, figs. 18*).—Varie es, cultural and field practices, and harvest and storage methods are recomended for growing forage (sorgo) and grain sorghums, largely from results of xperiments, 1925-37, at the U. S. Dry Land Field Station at Akron, Colo.

Leading forage sorghums were Leoti, Black Amber, and Fremont for altitudes elow 5,000 ft. and Dakota and Minnesota Amber for above 5,000 ft. and late lanting at lower elevations. Highland and Improved Coes were the best adapted r grain, and Sooner, Pygmy, Colby, and Day milo were the best combine types f grain sorghum. Favored production practices included planting May 20-25 t lower altitudes, delaying about 5 days for each increase of 500 ft. elevation ntil about June 8, forage sorghums at 6-10 lb. of treated seed per acre, plants paced 1-3 in. apart, and grain sorghums 2-3 lb. 4-12 in. apart, both in 40-44-in. ows on well-prepared seedbed preferably after fallow. Forage sorghums gave e highest yield of forage of any crops tested, producing about twice as much lage per acre as corn, and a total forage production nearly three times the eld of corn stover. Highland and Improved Coes produced 37 and 18 percent, spectively, more of an equally palatable stover than did corn and also about third more grain. The combine types of milo also produced more grain than d corn. Popcorn has produced less grain than field corn but about 18 percent ore stover.

Sudan grass harvested at maturity has yielded less than half as much forage the better-adapted forage sorghums. Drilled about June 15 on a good moist edbed and mowed two or three times during the season, it produced as much y as when allowed to mature, and the hay was very palatable and high protein.

Nitrogen in the cane leaf, Q. H. YUEN and F. E. HANCE (*Hawaii. Planters' c. [Hawaii. Sugar Planters' Sta.], 43 (1939), No. 3, pp. 163-207, figs. 14*).—at increasing increments of nitrogen applied to sugarcane above a certain nimum optimum have a depressing effect upon quality of juice was shown earlier studies of the station (E. S. R., 61, p. 34). Therefore, control of trogen fertilization is important both in cultural practice and related ecomic aspects. The research here reported indicated that such control may achieved by collecting leaf-punch samples at progressive intervals, obtaining eir total nitrogen content (nitrogen indices) by a rapid chemical method, d finding the crop's need for nitrogen from a study of the plotted data. actical applications are discussed and illustrated.

In a pot experiment a relationship was found between nitrogen content of e leaf samples and elongation of the stalk. The nitrogen contents of the ld samples were found to be within the same range as those determined

in potted cane. Growth data of field and potted canes indicated a similarity in the relationship between fluctuation of nitrogen content in the leaf system at periodic intervals and corresponding growth of sugarcane.

Variety tests of sugarcanes in Louisiana during the crop year 1936–37 and summary of annual results, 1935–37, G. ARCENEAUX, R. T. GIBBENS, JR., and C. C. KRUMBHAAR (*U. S. Dept. Agr. Cir. 531 (1939), pp. 27, figs. 2*).—Sugarcane variety tests (E. S. R., 75, p. 622) during 1935–37 again showed that cultivation of Co. 281 instead of other varieties of similar adaptability, such as C. P. 28/19 and C. P. 29/320, entails an important loss in yield of sugar per acre where the cane is not windrowed. Since Co. 281 is the only cane available for commercial cultivation with satisfactory windrowing qualities, it has preferred status for light soil areas. C. P. 28/19 again demonstrated very satisfactory ripening properties, and despite a measurable relative decline its yields have surpassed those from Co. 281 except in one locality. C. P. 29/320, somewhat inferior to C. P. 28/19 in sugar per ton of cane, consistently afforded satisfactory cane and in 1937 outyielded C. P. 28/19 by more than 650 lb. of sugar per acre. On soils of the lighter type, C. P. 28/11 could not compete with other available varieties and did not seem good enough to replace Co. 290 on heavy clay soils where the latter proved definitely superior to C. P. 807. C. P. 29/116 compared favorably with Co. 290 in yields of cane per acre but was consistently inferior in yield of sugar per ton of cane. C. P. 28/19 again gave, in general, the best results in tests on muck soils, but in the average of second- and third-stubble tests it was below C. P. 29/320 in yields of cane and sugar per acre.

Preliminary tests indicated that C. P. 29/89, 29/103, 29/108, 29/120, and C. P. 29/131, seedlings selected from the 1929 series, are less satisfactory than other varieties available for commercial culture. C. P. 29/99 and C. P. 29/137 showed satisfactory keeping qualities in windrow, their principal point of merit. During 1936 and 1937 both varieties surpassed Co. 281 in yields of cane and sugar per acre but proved inferior in yield of sugar per ton of cane.

Analysis of comparative yields of cane from different varieties over a period indicated that retrogressive changes in relative yield capacity of varieties should be considered carefully in interpreting the results of sugarcane variety tests.

Fiber content of commercial varieties of Louisiana sugar cane, M. A. MCCALIP. (U. S. D. A.). (*Sugar Jour., 2 (1939), No. 4, pp. 25–27, 28, 31*).—Fiber contents of popular commercial sugarcane varieties grown near Baton Rouge in 1938 averaged for plant cane of Co. 290 10.58 percent, Co. 281 12.43, C. P. 29/320 13.48, C. P. 28/19 13.61, and C. P. 28/11 15.24 percent, averaging as a group 13.07 v. 13.94 percent for stubble cane. Cut cane exposed to weather for 9 days before grinding increased in fiber content by 2 percent.

Dead cane at harvest, J. P. MARTIN (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 43 (1939), No. 3, pp. 209–216*).—Factors discussed as responsible for dead sugarcane at harvest include those of environment, varieties, cultural and field practices, economic conditions, insects, plant diseases, and various injuries.

Seed color studies in biennial white sweet clover, Melilotus alba, M. FOWLDS. (S. Dak. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 8, pp. 678–686*).—Color in the embryo may exert an influence upon the observed color of sweetclover seed because of translucence of the seed coat. In one form of sweetclover distinguished by seed color the seed coat and embryo are both green, while in another form the seed coat is white and the embryo is yellow. A pale green seed color, represented by two distinct forms, was ob-

served in a hybrid between green and yellow, but these pale green forms failed to breed true in the next generation. In a hybrid between yellow-mottled and green a segregate had the mottled condition combined with a green seed coat. Green seed color was inherited as a recessive to yellow and appeared to depend upon one main factor pair. Pale yellow seed color was also recessive to yellow. In a cross between green seed coat and the white seed coat of pale yellow seed the F_1 produced seed with a yellow seed coat. The expression of color in the seed coat appeared to depend upon complementary factors. Cross-pollination occurred freely between different varieties in this study. A small plat of green-seeded plants showed 10 percent of cross-pollination when grown 200 ft. away from a small group of yellow-seeded plants.

Velvet bent grass for putting greens and other fine turf, H. B. SPRAGUE (*New Jersey Stas. Cir. 393* (*1939*), *pp. 4*).—Approved ways to establish velvet bentgrass (*Agrostis canina*) for putting greens and lawns are outlined, with remarks on improved strains, care of closely cut velvet bent turf, and on buying seed.

The crop-producing value of vetch roots, W. B. ANDREWS. (Miss. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, *31* (*1939*), *No. 8*, *pp. 735, 736*).—The roots of vetch were found to contain 35 percent of the nitrogen in the whole plant. Corn without vetch averaged 15.9 bu. per acre, after vetch turned under 33.1, and after vetch with tops removed 23.3 bu. Cutting vetch for hay or grazing off by livestock evidently will leave about half of its crop-producing value in and on the soil for corn production.

Effect of relative humidity on viability, moisture content, and respiration of wheat, oats, and barley seed in storage, D. W. ROBERTSON, A. M. LUTE, and R. GARDNER. (Colo. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *59* (*1939*), *No. 4*, *pp. 281–291*, *fig. 1*).—In additional seed storage studies (E. S. R., 78, p. 624) involving Marquis wheat, Colsess barley, and Colorado 37 oats, part of which were treated with fungicides, the life of stored seeds was prolonged as the humidity decreased over the range studied. All grains suffered serious injury at 100-percent saturation within a month, but the injury decreased with lowered humidity. At the end of 1,032 days' storage in atmosphere of 57.6-percent saturation, only a slight loss in viability was found in some samples. The respiration, as measured by production of CO_2, increased regularly with relative humidity. Moisture percentage changed more consistently with humidity than either viability or respiration. The data showing rates of change of moisture and viability with humidity provided a way to predict the maximum period for safe storage under any given relative humidity, assuming temperature conditions comparable to those of the experiment. Heavy treatments with a fungicide before storage shortened the life of seeds stored at high humidities, yet heavy fungus growth developed on untreated grain.

A method of preparing some native grass seeds for handling and seeding, H. L. WEBER (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, *31* (*1939*), *No. 8*, *pp. 729–733*).—Processing with a modified hammer mill plus ordinary seed cleaning equipment has overcome at a low cost such seed characters as long awns and peculiar pubescence enough to permit passage of seeds of native grasses through the ordinary drill, and without change in viability immediately or after 6 months' storage of the cleaned caryopses.

Field trials of many seed stocks reflect value of breeding, M. T. MUNN (*Farm Res.* [*New York State Sta.*], *5* (*1939*), *No. 4*, *p. 5*, *figs. 2*).—Control field trials of commercial seed stocks revealed many inferior stocks of seed corn and widely-varying but improved stocks of dark red canning beets, showed the need for knowing the exact origin and type of red and white clover seed,

and demonstrated the marked superiority of approved varieties of barley, oats, and wheat sold as certified or equivalent.

Physiological problems involved in seed dormancy, E. H. Toole (*U. S. Dept. Agr., Bur. Plant Indus., 1939, pp. 9*).—A slight revision, with additions to the literature, of a paper previously noted (E. S. R., 77, p. 598).

Seed longevity and seed storage, E. H. Toole (*U. S. Dept. Agr., Bur. Plant Indus., 1939, pp. 5*).—A brief summary of data on the viability of seeds, with discussion and emphasis on the necessity of recording all influencing factors if reliable and comparable results are to be obtained in the testing of seeds.

Development of seed testing, E. Brown (*U. S. Dept. Agr., Bur. Plant Indus., 1939, pp. 11*).—This is a brief history of the objectives, development, and results of seed testing in Europe and the United States.

[Weed control in California] (*Calif. Dept. Agr. Bul., 28 (1939), No. 2, pp. 132–143, 163–165, figs. 5*).—Phases of current weed control research and activities are reported in articles entitled A Community Weed Cleanup Program for Control of Cotton Pests in the Palo Verde Valley, by E. Johnson (pp. 136–141), which includes a description of five-hook bassia (*Bassia hyssopifolia*); Pocket Gophers Spread Canada Thistle, by J. B. Cook (pp. 142, 143); and The Alien Plant Population of California, by W. W. Robbins (Univ. Calif.) (pp. 163–165).

Germination of Buried Weed Seeds, by W. L. Goss (coop U. S. D. A.) (pp. 132–135), reports that weed seeds buried October 1932 in soil under conditions simulating deep plowing in irrigated and unirrigated plats at Shafter, Calif., were tested March 1933, February 1934, February 1936, and March 1938. Indications were that seeds of Russian-thistle, hoary cress, Russian knapweed, camelthorn, puncturevine, and yellow star thistle lose vitality rather rapidly. Johnson grass, creeping mallow, and silversheath knotweed declined steadily but thus far have had vitality enough to be a menace. Morning-glory, silverleaf nightshade, and Klamath weed had not yet shown loss of vitality.

The weeds of South Africa, E. P. Phillips (*Union So. Africa Dept. Agr. Bul. 195 (1938), pp. 229, figs. 148*).—The species of weeds found in South Africa are described and illustrated, with notes on distribution and control, a determinative key, a glossary, and an index.

HORTICULTURE

[Horticultural studies by the Arizona Station] (*Arizona Sta. Rpt. 1938, pp. 46–55*).—Brief progress reports are presented on studies relating to grapefruit maturity, winter temperatures in Salt River Valley citrus groves, citrus fertilization and irrigation, physiological factors affecting fruit yield and quality, citrus chlorosis and decline, grapefruit storage, lettuce seed storage, phenological data on date palms, date ripening and storage, the status of pecan production, factors relating to fruiting of the pecan, pecan maturity, varieties of bush fruits, and rootstocks for the peach.

[Horticultural studies by the New Hampshire Station], H. C. Woodworth, W. W. Smith, L. P. Latimer, J. R. Hepler, and H. S. Clapp (*New Hampshire Sta. Bul. 313 (1939), pp. 5, 23–28*).—Among investigations the progress of which is reported are costs and returns of apple orchards, nature and causes of winter injury to apple trees, storage behavior of the Cortland apple, effect of holding McIntosh apples at moderate temperatures prior to cold storage, relation of time of picking McIntosh apples to keeping quality, pruning of apple trees, pollination of the apple, causes of premature dropping of McIntosh apples, effect of sodium-containing fertilizers on the strawberry plant, testing of fruit varieties, culture of the high-bush blueberry, propagation of the low-bush blueberry, apple root-

stocks, variety testing and cultural requirements of vegetables, and the transplanting of ornamental trees.

[**Horticultural studies by the New Jersey Stations**]. (Partly coop. U. S. D. A.). (*New Jersey Stas. Rpt. 1938, pp. 29, 30, 33, 47–79*).—Included are reports on the following studies: Fertilization and variety tests of blueberries; harvesting of cranberries; sterile culture of peach seeds; evaluation and testing of peach varieties; development and testing of peach seedlings; effect of weather conditions on the blooming of peaches; breeding of apples; blossom thinning of apples; blooming dates of apples and peaches; effects of mineral deficiencies on the peach tree; effect of morphological, chemical, and physical conditions in Sassafras soils on root development of the apple; effect of nutrient deficiencies on the apple tree; breeding of strawberries; resistance of strawberries to red stele; growth standards for strawberry varieties; soil management of raspberries; pepper breeding; relation of size of Ebenezer onion sets to yield and quality; relation of lime to tomato yields; importance of green manures in vegetable production; relation of K to the growth of the tomato; relation of various levels of fertility to the performance of tomato varieties; fertilization of old sod for tomatoes; relation of lime to the utilization of K by vegetable crops; effect of soil temperature on the growth and set of fruit of vegetable crops; relation of Ca and Mg on the growth of tomatoes in sand culture; variety testing of carrots, tomatoes, and other vegetables; nutrition of the gardenia and the rose; subirrigation methods of applying nutrients to carnations and roses; effect of depth of mediums of various kinds on the rose; flower and leaf development in the poinsettia; subirrigation of the sweet pea; testing of varieties of ornamentals; growing of ericaceous plants; relation of the spray schedule to spray residues; methods for evaluating the spreading and adhesive properties of spray mixtures; influence of foliage conditions on spray residue removal from apples; and the designing of "positive feed" home-made fruit washers.

Propagation of horticultural plants, G. W. ADRIANCE and F. R. BRISON (*New York and London: McGraw-Hill Book Co., 1939, pp. IX+314, pl. 1, figs. 182*).—This book, prepared primarily as a text for horticultural students, discusses the principles and practices of propagation by seed and by various asexual methods, such as the use of bulbs, grafts, buds, and layers. Particular emphasis is placed on woody plants, such as roses, fruits, and nuts.

Crushed pecan shells used in the cutting-bench mixture, G. H. BLACKMON and J. V. WATKINS. (Fla. Expt. Sta.). (*South. Florist and Nurseryman, 47 (1939), No. 8, pp. 9, 10*).—A mixture half-and-half of sharp sand with crushed pecan shells showed promise as a rooting medium for cuttings of various plants.

Effects of cane sugar, ethyl mercuric phosphate, and indolylacetic acid in talc on the rooting of cuttings, N. H. GRACE (*Canad. Jour. Res., 17 (1939), No. 10, Sect. C, pp. 321–333*).—Cuttings of two herbaceous plants, *Coleus blumei* and *Iresine lindeni*, and two dormant woody plants, *Lonicera tartarica* and *Physocarpus opulifolius*, were treated with a factorial series of talc dusts containing cane sugar, ethyl mercuric phosphate, and indoleacetic acid. The results indicate that cane sugar and ethyl mercuric phosphate, as well as indoleacetic acid, affect some of the rooting responses of plant cuttings. It is suggested that the dust method of treating cuttings may be used to supply factors other than the recognized growth-stimulating chemicals which are advantageous to successful vegetative propagation of plants.

Effect of indoleacetic acid on the growth of some crop plants, J. W. MITCHELL. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 171–176*).—Applied as a spray, solutions of indoleacetic acid containing 300 mg. per

liter repressed the growth of bean plants in the greenhouse. Weaker solutions had little effect. In 300-mg. concentrations or higher, the chemical caused extreme bending and distortion of the leaves, petioles, and stems of succulent plants. The effect was temporary, and the plants recovered their normal form. It was evident that the chemical quickly penetrated the walls and possibly the protoplasts of the epidermal cells. The spraying of oat and bean seeds with indoleacetic acid dissolved in oil or water had no effect on germination when plants were later set in the field or upon the fresh weight of the tops at time of fruiting. Indoleacetic acid in the irrigation water applied to beans grown out-of-doors increased the fresh weight slightly, but in no case did the chemical have any effect on the time of flowering of any of the plants under test.

Responses of dormant cuttings of Lonicera tartarica to solutions of cane sugar and indolylacetic acid, N. H. Grace *(Canad. Jour. Res., 17 (1939), No. 10, Sect. C, pp. 334–338)*.—Cuttings of dormant *L. tartarica* collected in March were treated with a factorial series of indoleacetic acid at concentrations of 0, 10, 50, and 100 p. p. m., and cane sugar solutions of 0, 1, 5, and 10 percent. The indoleacetic acid treatment greatly increased the percentage of cuttings rooted, the number and length of roots per rooted cutting, the fresh root weight, and the green weight of leaf produced. Cane sugar treatment alone or in combination with indoleacetic acid failed to show any significant effects, suggesting that dormant cuttings of this plant have an adequate reserve of carbohydrate material.

Responses of dormant cuttings of Lonicera tartarica to solutions of indolylacetic acid and nutrient salts, N. H. Grace and M. W. Thistle *(Canad. Jour. Res., 17 (1939), No. 10, Sect. C, pp. 317–320)*.—Cuttings of dormant *L. tartarica* collected in March were treated with a factorial series of indoleacetic acid and nutrient solutions, the acid being used at dosages of 0, 10, 50, and 100 p. p. m. in conjunction with 0, 1, and 10 concentrations of a modified Hoagland's nutrient solution. The indoleacetic acid treatment significantly increased the percentage of rooting, and the number and total length of roots, the fresh root weight, and the green weight of leaf per group of cuttings treated, the higher concentrations having the greater effect. The use of nutrients also significantly affected each of the foregoing characters. The results suggest that some dormant cuttings may be deficient in minerals essential for rooting, and that there is an optimum nutrient concentration somewhere below the highest used in this experiment.

Boron in horticulture, E. L. Overholser, F. L. Overley, and L. B. Wooton. (Wash. Expt. Sta.). *(Wash. State Hort. Assoc. Proc., 33 (1937), pp. 73–86, figs. 4)*.—Stating that B generally occurs in higher plants and that the irrigation waters of Washington are comparatively low in the element, the authors discuss the relationship of B to drought spot and to off shape in apples and to drought spot in pears. Experiments in which B was applied in different forms to soil or injected directly into the tree failed to show any positive control of cork spot or black end of pears. There was some evidence that Cu deficiency may be concerned with cork spot and manganese deficiency with hard end of pears.

Vegetable crops, H. C. Thompson *(New York and London: McGraw-Hill Book Co., 1939, 3. ed., pp. XI+578, figs. [69])*.—A complete revision (E. S. R., 50, p. 740), this book includes recent scientific advances in the field and discusses in a thoroughgoing manner the production and handling of vegetable crops, treated as a whole and as groups of species either related botanically or of similar cultural requirements.

A study of rapid deterioration of vegetable seeds and methods for its prevention, V. R. Boswell, E. H. Toole, and D. F. Fisher. (U. S. D. A.). *(Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 655–659).*—Observations on 10 kinds of seeds stored under identical and known humidities and temperatures showed the various species to have well-defined requirements for the maintenance of viability. At 80° F. and from 75 to 80 percent relative humidity, all seeds except beet showed deterioration within 110 days, and sweet corn, onion, and spinach were practically worthless within 60 days. At 80° and 66 percent r. h., sweet corn showed significant loss of viability in 40 days; kidney beans, peanuts, and onions at from 50 to 60 days; and lima beans at 80 days. Spinach was the only other species to show significant loss before 110 days. With a temperature of 80° and a relative humidity of from 40 to 50 percent, sweet corn kept better than at a 66-percent r. h. At a temperature of 50°, beans, sweet corn, peanuts, and onions were the only species to lose viability within the 110-day period.

Beans which had taken on moisture but had not lost their viability to a harmful extent were injured by rapid drying at 150°. On the other hand, beans of low moisture content were not injured. Peanuts were badly injured if they contained as much as 5 percent moisture when heating started. Sweet corn and small-seeded vegetables were apparently not injured by drying at from 120° to 150°.

Wax emulsions for vegetables, H. Platenius *([New York] Cornell Sta. Bul. 723 (1939), pp. 43, figs. 19).*—Using for the most part proprietary materials which were essentially colloidal suspensions in water of one or more kinds of wax kept dispersed by means of soap, the author observed a very definite benefit from waxing of various vegetables. With the exception of parsnips, all root crops were universally benefited by coating with wax after harvest. Outstanding results were obtained with topped carrots and cucumbers. Among other crops which gave promising results were asparagus, immature summer squash, winter squash in storage, husked sweet corn, eggplants, peppers, and tomatoes.

A study of the wax film indicated that the wax coat inhibits the diffusion of water vapor and other gases in accordance with the degree of solubility of the gases in the wax membrane. The film was very thin, being, in the case of recommended treatments, only from 1μ to 2μ in thickness. Waxed carrots showed a decrease in O_2 consumption but no noticeable change in CO_2 production. Waxing was found to reduce sugar losses in stored carrots. The benefits of waxing were in reduced rate of shriveling, lessened shrinkage losses, and immediate improvement in the appearance of the product.

In discussion of the commercial waxing of vegetables, the author points out the limitations of hand and mechanical methods and suggests the need of mechanical dryers equipped with fans and heating units to insure quick drying.

Effect of size, condition, and production locality on germination and seedling vigor of Baby Fordhook bush lima bean seed, R. E. Wester and R. Magruder. (U. S. D. A.). *(Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 614–622, fig. 1).*—Seed of a single plant of the Baby Fordhook lima bean was divided and grown for increase at Greeley, Colo., Beltsville, Md., and Charleston, S. C. Because the harvest season at Beltsville was characterized by a period of humid condition followed by a period of dry weather, the resulting seed was divided into two lots. The germination results from the two Beltsville lots indicated that conditions during maturity are highly important in the production of lima bean seed of high viability. Seed matured under the humid South Carolina conditions had a significantly lower germination percentage than that matured in Colorado under dry weather conditions. Seed with weather spots on the coats

had lower germination and produced more diseased seedlings than unspotted seed matured under the same conditions. Size of seed per se had no effect on germination percentage, but did have a direct influence on the size of the seedlings.

1939 cabbage experiments, J. A. Campbell and L. R. Farish (*Miss. Farm Res. [Mississippi Sta.], 2 (1939), No. 9, p. 7*).—An application of 1,500 lb. per acre of a 4-8-4 fertilizer gave larger yields of Golden Acre cabbage than did smaller or larger quantities. Differential fertilizer treatments in the coldframe had no material effects on yields in the field, but there was some indication that cabbage seedlings supplied with basic slag were more cold resistant. In variety trials Dark Green Copenhagen led in yield, followed closely by Charleston Wakefield. The varieties Ferry Round Dutch and Charleston Wakefield proved cold resistant.

A quantitative study of form and size in five varieties of carrots, W. H. Lachman. (Mass. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 623–625*).—In an effort to measure shape in several varieties of carrots, to compare its variability with that of size, to ascertain whether shape differed significantly among varieties, and to determine the effect of soil variability on shape, the author made observations on five varieties planted in a Latin square on well-prepared and well-fertilized soil. The data were obtained by cutting carrots longitudinally and measuring the polar diameter and the equatorial together with its two quartile transverse diameters. It was found that variance due to varieties was decidedly greater than that due to any other factor. It was observed that volume of roots was more influenced by soil variability than was shape of roots. Shape is evidently more constant than size.

The relation of certain floral abnormalities to the pollination of Cucurbita, H. L. Seaton and J. C. Kremer. (Mich. State Col.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), p. 626*).—Incidental to a study of factors influencing fruit setting and development in cultivated cucurbits, certain anatomical irregularities that appeared to influence insect visitation and pollination were observed in the nectaries and surrounding tissues. In the staminate blooms the irregularities were in the absence of and in the size of the apertures found in the flasklike structure formed over the nectary by the fusion or partial fusion of the anthers. In the pistillate flowers the major abnormalities were in the location of the nectary in relation to the lobes of the stigma and the spread of the corolla. Selection and inbreeding offer means of developing strains free from such abnormalities.

Rest period in cucumber seeds, V. M. Watts. (Univ. Ark.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 652–654*).—Seeking an explanation for poor germination of freshly harvested cucumber seeds, the author took seeds from slightly immature and fully mature Black Diamond fruits and sowed them directly in sand at from 24° to 27° C. (75.2° to 80.6° F.). Germination varied greatly, but the difference could not be attributed to the degree of maturity of the parent fruits. Where seed of mature fruits was held for from 10 to 40 days at about 22° prior to sowing the results were inconsistent, although there was an improvement in germination as time advanced. Treatments with chloroform, ether, and ethyl chlorohydrin were not effective, but the removal of seed coats was distinctly beneficial. Removal of seed coats plus wounding of the embryos gave even better results. Untreated seeds placed on moist filter paper and held at 30° germinated strongly, suggesting a practical means of initiating growth in freshly harvested seeds.

Methods for determining the percentage of seeds, strigs, stems, and leaves in commercial hops, C. G. Monroe and D. D. Hill. (Oreg. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 8, pp. 698–702*).—Immersion of hop

samples, preferably 20 gm., for 1 min. in methyl alcohol was found more satisfactory for removing the lupulin prior to determining the percentages of strigs and seeds than heating for 2 hr. at 115° C. or 6 hr. at 105°.

Effect of certain storage treatments on field and laboratory germination of seeds of Imperial 152 and Imperial 615 lettuce, M. F. WHARTON and W. A. FRAZIER. (Univ. Ariz.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 680–686*).—Seed of Imperial 152 and Imperial 615 lettuce harvested May 20 was placed under various storage conditions varying as to temperature and relative humidity. Germination at the beginning of treatments was very low. By August 17, with a germination temperature of 74° F., relatively high germination percentages were secured in the laboratory for most of the lots. Germination of seeds stored in muslin bags or in air-tight containers was good in practically all cases except where air-tight storage was at 40°. Field tests in late September showed far better germination in both open and sealed lots of seed which had been stored at higher temperatures. November plantings were more successful, due, possibly, to the greater age of the seed and better environmental conditions. Apparently high temperature storage of dry seed was effective in breaking dormancy and may be useful in seed which is to be used within 6 mo. following harvest.

Orach, its culture and use as a greens crop in the Great Plains region, M. F. BABB and J. E. KRAUS (*U. S. Dept. Agr. Cir. 526 (1939), pp. 23, figs. 4*).—Beginning with a discussion of historical and botanical aspects, the authors describe horticultural varieties and outline cultural methods which have been found successful in the production of the crop. At Cheyenne, Wyo., sowings made in late April and during May gave better results than those later. Of different rates of seeding tested, 2 oz. per 100 ft. of row proved best from the standpoint of yield and quality. Shallow seeding, 0.25 in., gave better results than did deeper planting. A moderate temperature of 68° F. gave better germination in the laboratory than did 86° or an alternation of 68° and 86°. Dusting seed or soil with Semesan proved helpful in preventing losses from damping-off fungus. Information is also included on the control of pests, culinary uses, and seed production.

New spinach varieties tested on muck and upland soils, W. D. ENZIE (*Farm Res. [New York State Sta.], 5 (1939), No. 4, pp. 3, 4, fig. 1*).—Herein are presented the results of variety tests conducted under replications at South Lima and Mount Morris, N. Y., in which Heavy Pack and Matador C varieties showed excellent commercial possibilities for spring cropping.

Composition of summer squash and its relationship to variety, stage of maturity, and use as a food product, C. W. CULPEPPER. (U. S. D. A.). (*Food Res., 2 (1937), No. 4, pp. 289–303*).—Fruits of the Early White Bush Scallop and Golden Crookneck squashes harvested at different stages of maturity were analyzed for dry matter, total sugars, proteins, tannins, and other constituents that might be related to edibility, and the results were correlated with cooking and canning tests. There was no indication that differences in chemical composition are sufficient to alter greatly the food value of the squashes. Texture appeared to be the primary factor in determining quality and palatability. All factors considered, the most favorable period for harvest under the conditions of midsummer at Arlington, Va., appeared to be between the sixth and the ninth days of maturity.

Tomato importations for breeding, H. F. BUTLER. (Univ. Tenn.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 674–676*).—The author obtained a total of 265 lots of tomatoes from 12 foreign countries and tested them for promising growth and fruit characters and resistance to defoliation. For the most part,

there was little correlation between the type of plants and the country from which derived. Of the more promising lots, 80 percent came from Peru, and among them four selections were almost free from leaf spots and other diseases. One Argentine lot produced excellent fruit of medium size and good shape which retained its leaves in a satisfactory manner.

Inspection, certification, and transportation of nursery stock in Kentucky, with a brief report for the year ended June 30, 1939, W. A. PRICE and H. G. TILSON (*Kentucky Sta. Regulat. Ser. Bul. 19 (1939), pp. 24, figs. 2*).—Herein is presented general regulatory information, together with notes on the present status of important insect and disease pests and lists of nurserymen within and without the State who have been certified as meeting requirements.

Fruit crops—principles and practices of orchard and small fruit culture, T. J. TALBERT and A. E. MURNEEK (*Philadelphia: Lea & Febiger, 1939, pp. 345, figs. 112*).—Designed to meet the needs of college students and of practical growers, this book presents general information on the growing and handling of temperate-zone fruit crops.

Tree fruit varieties for Kentucky, C. S. WALTMAN (*Kentucky Sta. Bul. 394 (1939), pp. 181–231*).—With general information as to adaptability, pollination requirements, and the desirability of testing new varieties on a small scale, descriptive data are presented on varieties, both old and new, of apples, crab apples, pears, quinces, peaches, nectarines, apricots, cherries, and plums.

Investigations on transplanting fruit trees, W. H. UPSHALL (*Sci. Agr., 19 (1939), No. 8, pp. 510–523, figs. 7*).—At Vineland, Ontario, peach trees succeeded best when planted in the spring, but fall planting was satisfactory for apple, pear, plum, and sweet cherry trees. Early spring planting gave results very similar to autumn. Except for the peach, delay in planting in the spring usually resulted in reducing stand and growth. In the case of fall-planted trees, new growth of the roots occurred often, most in the plum and least in the peach. Fall-planted trees lost from 7 to 10 percent of their weight by mid-April but recovered rapidly thereafter. On the average, moderate top pruning of sweet cherry trees was beneficial, but severe top pruning decreased new root growth, as recorded in late May. Disbudding did not reduce root growth in early spring and apparently was beneficial. Trimming the roots of nursery trees that had been heeled in over winter resulted in decreased tree growth.

The significance of frequencies and the amounts of irrigation water applied to orchards as related to soil moisture, C. A. LARSON. (U. S. D. A. and Wash. Expt. Sta.). (*Wash. State Hort. Assoc. Proc., 33 (1937), pp. 97–103, figs. 3*).—Following a discussion of the plan and operation of the orchard irrigation project at Prosser, Wash., the author reports that alfalfa plantings have measurably improved water penetration. The roots and stems tended to retard the flow of water in the furrow, and, in addition, the large roots were able to force their way through a compact and calcified subsoil layer and permit greater penetration. The need of adjusting the water supply to the rate of penetration is pointed out. Under the conditions of the experiment, the rate of water penetration was approximately one-third of an acre-inch per hour.

The significance of frequencies and the amounts of irrigation water applied to orchards as related to tree and fruit responses, W. J. CLORE. (Wash. Expt. Sta.). (*Wash. State Hort. Assoc. Proc., 33 (1937), pp. 105–110*).—Working in a 15-year-old apple orchard maintained under commercial conditions but without fertilizer treatment, the author noted in almost every case that as the amount of irrigation water increased there was a corresponding increase in terminal growth and in leaf area and trunk girth. When the same total amount of water was applied, 30-day intervals were more effective in increasing yield

than were 15-day intervals. Under the conditions of the experiment, a net total of 40 acre-in. per season, applied at 30-day intervals, was satisfactory for growth and production. At times, 30 acre-in. per season were not sufficient to meet crop and tree needs.

Some comparisons of methods of measuring fruit respiration, M. P. MASURE. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 223–229*).—In a brief study of fruit respiration a comparison of rates was made as measured by two titrimetric systems, one employing Reiset towers and the other a modified Magness and Diehl apparatus. The results indicate that the latter system gives values approximately 6 percent lower than the former. Values obtained from a gravimetric system run simultaneously with the other two, and employing Ascarite as the CO_2 absorbent emphasized the necessity for use of a desiccant to absorb the water given off by Ascarite in its absorption reaction. The fact that Ascarite values were approximately 8 percent lower than those obtained with the tower system, even after allowing for a desiccant error, also suggests that precautions in addition to that of the use of a desiccant might well be considered in precision studies. It has been assumed, solely on the basis of magnitude, that the tower system gave the most nearly correct rates.

Re-establishing and maintaining cover crops in apple orchards, O. M. MORRIS. (Wash. State Col.). (*Wash. State Hort. Assoc. Proc., 33 (1937), pp. 67–72*).—Soil collected from fields that had never been in orchard or in other sprayed crops was treated with lead arsenate at rates of 1, 2, 3, 4, and 5 tons per acre and planted to alfalfa. Even with 1 ton the alfalfa yields were cut in half, as compared with the controls. Greater amounts of arsenate of lead reduced growth to a minimum. On the other hand, calcium arsenate or fluorine, even up to 5 tons per acre, had no detrimental effect on alfalfa growth. Phenothiazine applications were highly injurious. A study of the effects of applying arsenious acid, lead acetate, and lead nitrate to soils indicated that arsenic, rather than lead, is the actively injurious factor in lead arsenate injury to cover crops. Alfalfa plants watered with leachings from pots of soil collected in a heavily sprayed orchard made very little growth but recovered when treated with manure water.

In other trials, it was evident that young alfalfa benefits by surface watering, as compared with subirrigation. A number of materials, such as wheat straw, barnyard manure, superphosphate, iron sulfate, zinc sulfate, sulfur, lime, and muck, were tested as correctives for spray residues. In most cases there was no benefit, but zinc sulfate used singly or in combination with iron sulfate gave promising results. Manure, alfalfa meal, ammonium sulfate (alone or with wheat straw), and superphosphate proved helpful. A second planting of alfalfa grew better than the first. Summing up, spray deposits have evidently interfered with reestablishing alfalfa, and applications of organic matter and certain materials, such as iron sulfate, have been helpful in offsetting the deleterious effects. The methods of watering were also concerned in the reestablishment of cover crops.

Apple root systems under different cultural systems, T. SUSA (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 150–152, figs. 3*).—Presenting measurements on the lateral and vertical distribution of the roots of apple varieties on *Malus sieboldi* stocks, the author points out that broadcasting manures or fertilizers, as compared with placement in a ring about the tree, increased materially the total number of roots and the percentage of fine feeding roots.

Scion rooting on mature double-worked apple stocks, T. J. MANEY. (Iowa Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 143, 144, figs. 2*).—Observations in the spring of 1938 on Hibernal and Virginia Crab interstocks root-grafted on French seedlings and top-worked with Sharon and Ben Davis

showed in all cases root formation by the interstocks. In general, the main interstock roots developed from about 6 to 8 in. above the graft union and were fairly well distributed about the trunk. In the 13 yr. since planting, these interstock roots had dominated the root system, and in some cases the original roots had perished.

Abnormal behavior of newly set Oldenburg buds, J. K. SHAW. (Mass. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 126–128, figs. 2*).—Buds taken from 25-year-old Oldenburg trees and inserted in August 1937 in three different Malling rootstocks produced, in 1938, instead of the normal leafy shoot growths all sorts of abnormal flowerlike growths and intergrades between flowers and leafy shoots. Most of the abnormal growths later developed into fair nursery trees. Since no such abnormal flowers developed on the parent trees, the author is at a loss to account for the phenomenon.

Bud development for the fruit-bearing spur of the Wagener apple, H. P. BELL and J. W. MCLELLAN (*Canad. Jour. Res., 17 (1939), No. 10, Sect. C, pp. 339–359, figs. 24*).—The complete development of the growing tip of the lateral fruit spur of the Wagener apple, from the time of its initiation until it produces mature fruit, requires four seasons. The development during the first 3 yr. may be divided into six typical phases, during each of which is found growth characteristic of and different from that of any other stage. The phase just before initiation of the flower extends through June and the first half of July of the third year. During this period the crown broadens and flattens, the promeristematic tissue become shallow, the scale and leaf primordium bases remain level with the crown, and the provascular strands and pith become broadly hemispherical. This phase is followed by flower formation, which is initiated during the last part of July by the triangular, horizontal, upper surface of the crown's becoming circular and developing five sepal primordia for the terminal flower. The flower cluster as a whole is "determinate," but its lateral flowers are axillary in origin and appear in acropetal succession. It is suggested that the changes occurring in the tip of the "off" spur during June, namely, the broadening and flattening of the crown, etc., may be an indication that physiological differentiation of the crown into flower-forming tissue is taking place.

Yields from young apple trees topworked on Arkansas, G. G. BROWN. (Oreg. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 141, 142*).—At Hood River, Oreg., an intermediate trunk and scaffold of Arkansas (Mammoth Black Twig) tended to increase the yield of young interplant trees as compared with trees without the interstock.

Spraying apples for the prevention of fruit set, P. H. SHEPARD (*Missouri Fruit Sta. Cir. 28 (1939), pp. 27, figs. 6*).—In search of means of breaking the biennial habit of fruiting in certain varieties of apples, the author studied various materials that might kill the blooms with little or no injury to the foliage and trees. Most of the sprays used caused slight to severe foliage injury. In all cases, later-developing foliage remained uninjured. Of the five more promising materials tested, cresylic acid in concentrations of from 0.5 to 2 percent and tar oil No. 1 at 3 percent proved most effective in destroying the flowers. The most effective time of applying materials was in the late cluster-bud stage, when the center bloom was beginning to open and before the pedicels had separated or lengthened to any extent. The tar oils and cresylic acid prevented fruit set by killing the pedicels. The higher the concentration, the more rapid was the killing action.

Spraying with plant growth substances to prevent apple fruit dropping, F. E. GARDNER, P. C. MARTH, and L. P. BATJER. (U. S. D. A.). (*Science, 90*

(1939), No. 2331, pp. 208, 209).—The spraying of trees of several varieties of apples with various concentrations of growth substances showed that naphthaleneacetic acid and naphthaleneacetamide applied just prior to fruit maturity were highly effective in preventing the abscission of the fruits. Two other materials, indoleacetic and indolebutyric acids, were much less effective. Apparently the chemicals may be added to the regular spray materials. Data on Williams Early Red sprayed with 0.001 percent naphthaleneacetic acid on July 13 showed only 1.3 to 1.5 percent dropping by July 25, as compared with 64.2 to 90.8 percent dropping in the control trees.

A comparison of pruned and unpruned trees during the first ten years in the apple orchard, E. W. GREVE. (Del. Expt. Sta.). (*Peninsula Hort. Soc. [Del.] Trans., 52 (1938), pp. 45–55*).—In an orchard established in 1929 and consisting of Yellow Transparent, Stayman Winesap, Delicious, Grimes Golden, and Rome Beauty, half of the trees of each variety were not pruned after the first year. At the end of the fifth growing season the unpruned trees of all varieties had made the greater trunk growth. However, only in the Stayman Winesap variety was the difference statistically significant. At the end of 9 yr. the circumferences of the pruned Yellow Transparent and Delicious trees were actually larger, significantly so in the case of the Yellow Transparent. Location of unpruned trees near forest trees is believed to have been a factor. In Grimes Golden only were the unpruned trees significantly larger in trunk girth than were the pruned. With respect to yields, when all five varieties were grouped together the unpruned trees greatly outyielded the pruned. Size and color were satisfactory in the unpruned Delicious, Stayman Winesap, and Rome Beauty trees, but in the Yellow Transparent and Grimes Golden the fruit size was declining in the unpruned group.

Success with dwarf apple trees for amateurs, H. B. TUKEY (*Farm Res. [New York State Sta.], 5 (1939), No. 4, p. 9, figs. 3*).—Pointing out the utility of small trees for the home garden and for decorative purposes, the author indicates varieties which have done well on dwarfing rootstocks. One of the best for all purposes was Delicious.

Red color in apples, R. B. DUSTMAN and I. J. DUNCAN. (W. Va. Expt. Sta.). *Science, 90 (1939), No. 2332, p. 233*).—Brief mention is made of a procedure for enhancing the red color of apples by spraying the foliage and fruit during the growing season with certain materials, of which the thiocyanate ion appears to be the effective agent.

Respiration curve for McIntosh apples, W. R. PHILLIPS (*Sci. Agr., 19 (1939), No. 8, pp. 505–509, figs. 2*).—Determinations of the CO_2 output of apples stored at 55° F. indicated that the respiration rate assumes a downward trend from harvest until the end of the storage life. Further investigations revealed that the senescent hump in respiration occurs at or just prior to the time of harvest. Apparently, McIntosh apples store better and develop much higher quality if the senescent hump phase is passed on the tree. In other experiments it was shown that if apples were allowed to pass the climacteric phase while on the tree they were much less susceptible to CO_2 injury during storage or to methyl bromide injury during fumigation.

A comparison of wetting agents in apple washing, A. L. SCHRADER and L. H. HALLER. (Md. Expt. Sta. and U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 243–246*).—York Imperial and Stayman Winesap apples which had received from five to seven cover sprays of lead arsenate, 3 lb. per 100 gal., plus mineral oil in many cases were passed through a flotation-type washer in which various proprietary wetting agents had been added to a 1.5 percent hydrochloric acid solution. The results indicated that certain of the wetting

agents were effective in aiding the removal of lead residues, both at the usual room temperature and at 100° F. When oil was included in the late sprays, wetting agents were more effective in the heated solution. Such factors as apple variety and temperature of the wash may influence the effectiveness of any wetting agent.

The pollination of the sweet cherry on Vancouver Island, British Columbia, E. R. HALL (*Sci. Agr., 19 (1939), No. 8, pp. 524–530, fig. 1*).—At Saanichton, B. C., eight varieties of sweet cherries were studied as to pollination capacities and requirements. There was observed sufficient overlapping of the blooming seasons to provide adequate pollen, and all eight varieties produced abundant pollen. All varieties were found to be completely self-unfruitful. Bing, Lambert, and Napoleon were interincompatible. Deacon was a satisfactory pollinizer for most varieties. Sour cherry pollen was found capable of fertilizing sweet cherry flowers.

Reduction of cracking in sweet cherries following the use of calcium sprays, L. VERNER. (Idaho Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 271–274*).—The fruits from representative branches of Bing and Lambert sweet cherry trees sprayed with different strengths of bordeaux mixture and with water solutions of Ca hydroxide and Ca acetate were tested for their susceptibility to cracking by immersion in water. In addition, freshly picked unsprayed fruits immersed in the laboratory in water solutions of different forms of Ca were tested in water immediately following treatment. Cherries on the tree required more than two times as much exposure to rain to reach a given stage of cracking as did the immersed fruits. Spraying with bordeaux mixture greatly reduced the amount of cracking. However, since sprays of hydrated lime alone were just as effective, the author concludes that Ca is the effective constituent. In the present stage of development, none of the treatments is considered fully desirable because of objectionable residues.

Hardy rootstocks for the peach should extend well above the surface of the soil, M. A. BLAKE. (N. J. Expt. Stas.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 138–140*).—In the severe winter of 1933–34, bark splitting occurred in the trunks of many peach varieties including Greensboro, regarded as one of the hardiest peaches in the Northeast. It was apparent that hardiness of the lower trunk is not always correlated with hardiness of fruit buds. Seedlings grown from pits of named varieties differed notably in trunk hardiness, and some of the hardy stocks were found among "natural seedlings." Seedlings grown from southern stock pits were found to vary greatly in vigor, habit of growth, time of maturity, and hardiness. Five types of these are described, including a red-leafed group which contained some individuals with notably hardy trunks.

Some plant characteristics of the progeny of Prunus persica and Prunus kansuensis crosses, E. M. MEADER and M. A. BLAKE. (U. S. D. A. and N. J. Expt. Stas.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 287–291, figs. 6*).—Studies of the progeny of two crosses between J. H. Hale (*P. persica*) and *P. kansuensis* showed them to be like the *P. kansuensis* parent in general tree characteristics, with a willowy, bushy, suckering habit of growth. The twigs, leaves, and flowers were larger than those of the *P. kansuensis* parent. In their first year the seedlings made very remarkable growth. With respect to pubescence, the fruit buds were intermediate between the parents. Blooming was much earlier than in the J. H. Hale peach. All blooms were pink, with segregation into large and small sizes. No pollen sterility was noted. In both crosses edible quality was low, with many seedlings showing high acidity or astringency. The parent *P. kansuensis* is described in detail.

Grape and small-fruit varieties for Kentucky, C. S. WALTMAN (*Kentucky Sta. Bul. 396 (1939), pp. 281–315*).—Preceded by general notes as to adaptability, extent of culture, etc., descriptive and other pertinent information is presented on varieties.

Reducing sugars in the strawberry plant, J. H. LONG (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 495–497*).—Data on the seasonal changes in total reducing sugars showed that during the months of relative inactivity the proportion was larger in the roots and stems, suggesting a storage of carbohydrates. Yellowing and dying leaves contained much less reducing sugar than did active green tissues. Reducing sugars apparently contained about 40–70 percent of the total sugar in the strawberry plant.

Red raspberry breeding for southern adaptation, B. D. DRAIN. (Univ. Tenn.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 302–304*).—Starting with selfed seedlings of Van Fleet, itself presumably a cross between Cuthbert and *Rubus kuntzeanus*, backcrosses were made with varieties such as Cayuga, Chief, Latham, and Viking. The new group of seedlings was less susceptible to mosaic but more susceptible to leaf spot than the selfed Van Fleet population. The second series of backcrosses with Lloyd George produced a population averaging high in leaf spot and low in mosaic susceptibility. Many of the seedlings produced fruit of very good commercial quality, and several were distributed to growers for trial. A preliminary study of the pollen of some of the better seedlings showed considerable variation in quality. Both self- and intersterility were found, but many of the more promising seedlings were highly self-fruitful.

The use of chemicals in rooting raspberry leaf-bud cuttings, E. ANGELO. (Minn. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 129, 130*).—In August, 300 leaf-bud cuttings taken from a selected black raspberry seedling were divided into 4 lots of 75 each and treated, respectively, with (1) tap water, (2) an aqueous solution of indolebutyric acid, (3) an aqueous solution of indoleacetic acid, and (4) a sand rooting medium. The liquid treatments were for 16 hr., following which the cuttings were placed in sand. Water alone and both of the growth-promoting solutions were very harmful. Abundant rooting, on the other hand, occurred where cuttings were placed directly in sand. The author suggests that different concentrations and methods of treatment might have given better results.

Investigations on mulching red raspberries, G. M. DARROW and J. R. MAGNESS. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 481–484, fig. 1*).—At Beltsville, Md., where the growing season is long and relatively hot and humid and where raspberries make unfavorable growth despite good care, Latham plants were mulched with rye straw at the rate of about 8 tons per acre. In addition, nitrate of soda was applied in April and July to the mulched and control cultivated rows. The conditions were so favorable that at no time did the clean-cultivated plants suffer from moisture deficiency. At 2-in. depth, soil temperatures were higher in summer and lower in winter under tillage than under mulch. The total cane growth was much greater in the mulched row than in the cultivated, and the total number of sucker plants produced during the 3 yr. was about 16 times as great in the mulched area. Yields in 1938 were 5 times as large in the mulched as in the cultivated block, but no significant differences were established in berry size. Determinations of the potash of leaves collected in the fall of 1938 from mulched and cultivated plats showed 2.39 and 0.86 percent, respectively, a very striking contrast.

Some observations on the propagation of the high-bush blueberry, A. E. STENE. (R. I. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 158–*

160).—Using two types of mediums (Holland peat alone and three-fourths peat and one-fourth sand) in three frames, two of the box type used by the Michigan Experiment Station (E. S. R., 63, p. 537) and one an uncovered cold frame in which a tray was suspended 6 in. above the bottom, the author observed that the cuttings leafed out first in the unventilated box frame, next in the ventilated box frame, and last in the cold frame. Disease in the covered frames was the chief limiting factor to satisfactory rooting, the percentages of which were 44, 32, and 26 in the ventilated, unventilated, and open cold frames, respectively. Holland peat alone gave indication of being a satisfactory medium, particularly if sterilized. Considerable variation in rooting capacity was observed among named varieties.

A spectrographic study of Concord and Ontario grape varieties, C. A. Magoon, A. T. Myers, I. W. Dix, and B. C. Brunstetter. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 485–491, fig. 1*).—Observations on the mineral contents of the leaf and nodal tissues of the Concord and Ontario grapes grown under different cultural and fertilizer treatments showed well-defined differences between the varieties in certain elements and in one or two cases significant effects of differential cultural treatments. In the young growing leaves the Ontario grape was higher in P and Cu and the Concord higher in Mg. Leaves had larger percentage contents of most of the minerals than had the nodes. Ca was present in about equal amounts in both tissues. Mulching significantly increased the Cu content of Concord leaves and the Mg content of Ontario leaves. Comparing the influence of complete fertilizer with nitrate of soda alone, significant differences in favor of the complete mixture were observed in the P content of Concord leaves and in the B content of Ontario leaves. Nitrate of soda alone increased the amount of Mn in the nodes of the Concord variety. The possible significance of the findings is discussed.

Promising new grapes—green or yellow varieties, L. M. Van Alstyne (*Farm Res. [New York State Sta.], 5 (1939), No. 4, p. 12*).—In this, the second of a series devoted to grapes originated by the station (E. S. R., 81, p. 792), the author discusses the Ontario, Ripley, Brocton, Golden Muscat, Stout Seedless, and Seneca varieties.

Growth rate of cross and self-fertilized cacao, O. J. Voelcker (*Trop. Agr. [Trinidad], 16 (1939), No. 9, pp. 203–205, fig. 1*).—Measurements of growth in a plantation established in 1935 failed to show any significant increase in vigor due to cross-pollination.

Some problems connected with fertilization of alkali soils, W. T. McGeorge. (Univ. Ariz.). (*Calif. Citrog., 24 (1939), No. 11, pp. 389, 424, figs. 2*).—Pots containing (1) an alkaline-calcareous soil, (2) a noncalcareous Arizona soil, and (3) a noncalcareous midwestern soil were planted to corn and irrigated with water of pH 3.0, 7.0, and 8.5. Analysis of the plants at about 6 weeks showed that Fe, Mn, ash, and phosphate were absorbed in largest amounts by the plants receiving pH 3.0 water and in least amounts by the pH 8.5 group. Analyses in 1939 of the fruit of citrus trees around which a band of S had been placed in 1934 at a depth of about 1 ft. showed more Mn, Fe, and ash in the juice and more Mn and ash in the rind of fruit of the S-treated trees than of the controls. The treated trees were completely free of chlorosis, and the leaves were higher in Mn than those of the controls.

On the cellular nature of the citrus juice sac, F. M. Turrell. (Calif. Citrus Expt. Sta.). (*Calif. Citrog., 24 (1939), No. 11, p. 386, figs. 4*).—This is a brief note on the structure of the juice sac, based on reports in early publications and on recent investigations.

Effects of indole-3-butyric acid in the rooting of transplanted pecan trees, L. D. Romberg and C. L. Smith. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 161–170, figs. 6*).—Treatment of comparable roots of pecan nursery seedling trees with indole-3-butyric acid applied by insertion of toothpicks in bored holes, as lanolin paste, and in wheat flour dough gave, in all cases except the dough mixture, marked increases in rooting as measured by the average dry weight, the number, and the average total length of the roots. The toothpick technic was the most satisfactory from the standpoint of economy in time and material. Toothpicks carrying 4 mg. of indole-3-butyric acid were more effective than those with a lower dosage. The diffusion of indole-3-butyric acid from the taproot to the adjacent laterals was indicated in the increased rooting of the latter. Favorable response was secured with 10-year-old trees, generally considered difficult to transplant.

Three years results of thinning the stand as compared with pruning thickly planted pecan trees, C. L. Smith. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 339–346, figs. 2*).—As a result of a study at Stephenville, Tex., of the comparative effects of pruning and tree removal as means of overcoming crowding in pecan groves, the author reports that with 12-year-old Burkett and Texas Prolific trees pruning was the better method of increasing production. The average yield of nuts per acre for the 3 yr. subsequent to treatment was about twice as great in the pruned trees as the unpruned, thinned trees, and the gross acre income was proportional to yields. Due to the stimulation of growth by pruning, the pruned trees had more foliage per nut in years of fair-to-good crops and apparently were better able to fill the nuts and store reserves in the tree for the succeeding crop. Furthermore, the foliage on the pruned trees tended to remain in good condition later in the autumn.

Cultural experiments on tung trees, J. C. Robert. (Miss. Expt. Sta.). (*South. Conserv. and Amer. Tung Oil, 6 (1939), No. 1, pp. 3, 22*).—In the case of trees planted in April 1934 on well-drained soil of good fertility, the continued lack of cultivation and fertilizer resulted in practically no crop in 1938. The combination of no cultivation and nitrate of soda or stable manure resulted in net monetary losses, but combination of cultivation and stable manure or nitrate produced highly profitable yields. On a less desirable site the combination of cultivation with summer and winter legume covers gave good results, although not equal to those secured with cultivation and fertilizers on the better site.

A new fragrant gladiolus hybrid, F. T. McLean (*Contrib. Boyce Thompson Inst., 10 (1939), No. 3, pp. 377–380, fig. 1*).—A brief account is presented of the origin and development of a fragrant gladiolus derived from a cross of a seedling of *Gladiolus tristis* × *G. recurvus* parentage with pollen of the garden variety Gretchen Zang.

Germination and storage of lily seeds, L. V. Barton (*Natl. Hort. Mag., 18 (1939), No. 3, pp. 193, 194, fig. 1*).—Germination experiments with seed of *Lilium auratum*, *L. canadense*, *L. japonicum*, *L. rubellum*, *L. superbum*, and *L. szovitsianum* (*monadelphum*), species which produce small bulbs but do not send up shoots the first season, showed all to require from 3 to 6 mo. at a temperature of about 68° F. for the growth of the roots. When seedlings with well-developed roots were placed in storage at from 33° to 50°, 3 mo. was sufficient to break the dormancy of the shoots and permit leaves to appear above the ground promptly when removed to a favorable environment. Air-dry seeds of *L. regale* retained their germination capacity for at least 6 yr. when stored in sealed containers at either 41° or below freezing.

Lilies for American gardens, G. L. Slate (*New York and London: Charles Scribner's Sons, 1939, pp. XV+258, pls. [31, figs. 25]*).—Herein is presented comprehensive information on the history, botany, culture, breeding, propagation, control of pests, characteristics, and special cultural requirements of various species and varieties.

Wall shrubs and hardy climbers, W. J. Bean (*London: Putnam, [1939], pp. XII+182, [pls. 48]*).—This general treatise is divided into two parts, the first of which includes cultivation, methods of support, pruning, and types of climbers and wall shrubs and the second a descriptive list of climbers and wall shrubs.

FORESTRY

Economics of private forestry, R. W. Marquis (*New York and London: McGraw-Hill Book Co., 1939, pp. VII+219*).—This volume, intended for foresters, forestry students, forest owners, and students of economics interested in forest conservation, deals chiefly with the economic determinants of the prices of forest products, supply and demand, economic obstacles and incentives to sustained-yield practice, and the comparison of liquidation and sustained yield from the point of view of profitable management. Such subjects as forest management, mensuration and valuation, wood-using industries, and forest uses are considered only as they relate to sustained-yield economics, and only limited consideration is given to the practice of forestry on publicly owned lands.

Ohio Forest News, [October 1939] (*Ohio Forest News [Ohio Sta.], No. 37 (1939), pp. 8, fig. 1*).—Herein is presented, in addition to general information regarding State forestry legislation, community forests, surveys, etc., an abstract of a paper entitled Opportunities for Research in Forestry, by E. Secrest, director of the Ohio Experiment Station.

Trees of the South, C. H. Green (*Chapel Hill: Univ. N. C. Press, 1939, pp. XIV+551, [figs. 213]*).—Information of a botanical and general nature is presented relative to trees, both native and introduced.

Loblolly pine versus cotton: A comparison of annual cellulose production per acre, H. Bull (U. S. D. A.). (*Jour. Forestry, 37 (1939), No. 7, pp. 570, 571*).—Stating that wood cellulose now competes with cotton cellulose in the manufacture of many products, the author shows that on Arkansas soils of only moderate productivity for cotton loblolly pine is capable of producing about 4.5 times as much cellulose per acre as would cotton.

Soil depth and height growth of black locust, E. G. Roberts. (Miss. State Col.). (*Jour. Forestry, 37 (1939), No. 7, pp. 583, 584*).—Very definite correlations of growth with depth of the surface soil were shown by data collected in 1938 in plantations of black locust established in March 1935 on various types of upland soil. The results indicated that black locust is not a low-fertility tree but should be planted where considerable surface soil is present.

Simplified growth determination with increment borer, A. B. Recknagel (Cornell Univ.). (*Jour. Forestry, 37 (1939), No. 7, pp. 582, 583*).—A new technic for measuring the current annual increment is described, together with an example of its application in a 40-year-old hardwood stand.

A simple method of making germination tests of pine pollen, F. I. Righter. (U. S. D. A.). (*Jour. Forestry, 37 (1939), No. 7, pp. 574–576, figs. 2*).—There is presented a description of a simple, rapid, and accurate method for determining pollen viability.

Rooting Norway spruce cuttings without chemical treatment, C. G. Deuber and J. L. Farrar (*Science, 90 (1939), No. 2327, pp. 109, 110*).—Observations on

cuttings taken from a 39-year-old tree at monthly intervals from October to January and placed in sand in an open greenhouse bench with day temperatures around 70° F. and night temperatures never lower than 55° showed that the season of taking cuttings was the most important factor in successful rooting. Treatments with indolebutyric acid appeared to retard rooting. Long cuttings were superior to short, and those without heels of 2-year-old wood rooted more freely than those with heels. The best rooting was secured with 10–20 cm. (3.9–7.9 in.) cuttings collected in December and planted directly in the bench.

Some experiments with fertilizers for evergreen seedlings, J. A. Larsen and W. G. Stump. (Iowa State Col.). (*Iowa State Col. Jour. Sci., 13 (1939), No. 3, pp. 293–311, pls. 3*).—On a somewhat alkaline soil, aluminum sulfate, sodium nitrate, and a 2–12–6 mixture all stimulated the top growth of white pine seedlings. Of the three treatments, aluminum sulfate alone increased root growth. In greenhouse trials, Norway pine and white spruce responded well to a combination of superphosphate, muriate of potash, and sodium nitrate. In the case of white and jack pines, the application of superphosphate, steamed bonemeal, or a combination of superphosphate with muriate of potash gave good results. In nursery trials, superphosphate increased the weights of 1–0 white pines very materially, especially their root portions. Nitrogen content of the leaves was increased by nitrogen fertilizers and superphosphate. Phosphorus content of the roots was increased by a combination of superphosphate, bonemeal, and muriate of potash. In the nursery a combination of fertilizers containing nitrogen, phosphorus, and potassium was, in general, more effective than any single element. In greenhouse trials, single elements occasionally proved more effective.

Shrinkage of white oak as affected by position in the tree, B. H. Paul. (U. S. D. A. and Univ. Wis.). (*Jour. Forestry, 37 (1939), No. 7, pp. 572, 573, figs. 3*).—Studies with old-growth white oak from the Cumberland Mountains in Tennessee showed that shrinkage of the wood increases with its age in the tree, that is, the wood near the center and base of the tree shrinks more in older than in younger trees. Apparently the tendency to collapse, which is here included as shrinkage, increases as the tree grows older, possibly because of the infiltration of additional material with time in the interstices of the pit membranes, thereby making them still smaller and more resistant to the withdrawal or rupture of water films in them.

The relation of fire to stand composition of longleaf pine forests, F. Heyward (*Ecology, 20 (1939), No. 2, pp. 287–304, figs. 7*).—As a result of a detailed study of the stand composition of 51 long-unburned forests of longleaf and slash pines, in comparison with nearby forests which had been subjected to repeated burning, the author concludes that with fire exclusion a pure longleaf pine type may become a mixed pine-hardwood forest. Apparently, without silvicultural treatments, the hardwoods will ultimately dominate the forests to the exclusion of the pines. Since the pines are more valuable, measures to repress the hardwoods are advisable except in special cases, such as for game production.

The art and science of protecting forest lands from fire, G. H. Schroeder (*Corvallis, Oreg.: OSC Coop. Assoc., [1938], pp. X+184, [pl. 1], figs. [73]*).—This manual, prepared primarily for the student forester, contains pertinent information as to underlying principles and practices.

DISEASES OF PLANTS

[**Abstracts of phytopathological papers**] (*Assoc. South. Agr. Workers Proc., 40 (1939), pp. 67, 68, 138, 139, 140, 141, 179–191*).—The following are of interest to phytopathology: Variations in Relation to Cotton Wilt, Abstract of Results Obtained 1936–1938, by H. B. Tisdale, and Fertilizers in Relation to Incidence of Wilt as Affecting a Resistant and a Susceptible Variety, by J. B. Dick (both U. S. D. A. and Ala. Polytech. Inst.); Some Recent Investigations on the Control of Sweet Potato Diseases, by L. L. Harter (U. S. D. A.); A Modified Spray Schedule for Apples, by H. R. Niswonger (Univ. N. C.); The Effect of Root-Knot Upon the Subsequent Growth of Tung-Oil (*Aleurites fordi*) Seedlings, by R. D. Dickey and H. Mowry (Univ. Fla.); Leaf Blotch, a New Disease of Rice and Certain Native Plants in Louisiana, by T. C. Ryker, and Further Studies on Control of Soil Rot of Sweet Potatoes, by L. H. Person (both La. Expt. Sta.); The Necessity of Rotation of Crops for the Control of Diseases of the Sweet Potato, by R. F. Poole (N. C. Sta.); Seed and Soil Treatments for Combating Damping-Off of Tomatoes, Eggplants, and Peppers, by L. H. Person (La. Sta.); Difference in Susceptibility of Tomato Varieties to *Septoria* and *Macrosporium* Leaf Spots, by J. O. Andes (Tenn. Sta.); Control of *Cercospora* Leafspots of Peanuts With Various Dusts and Sprays, by L. Shaw (Univ. N. C.); Bordeaux Injury to Cucumbers, by A. G. Plakidas (La. Sta.); The Fungi That Cause Root Rot and the Possibilities of Their Control Through Soil Treatment With Chemicals, by R. F. Poole (N. C. Sta.); Carbon Dioxide Evolution From Certain Soils in Relation to Black Root Rot of Flue-Cured Tobacco, by J. A. Pinckard and L. Bozovaisky (Va. Sta.); An Internal Collar Rot of Cotton, by C. J. King and H. D. Barker (U. S. D. A.); Root-Knot Nematodes on Cotton and Tomatoes in Tennessee, by C. D. Sherbakoff (Tenn. Sta.); Observations on the Root-Knot Nematode in the San Joaquin Valley of California, by C. E. Scott, M. A. Lindsey, and G. J. Harrison (U. S. D. A.); Preliminary Report on Cotton Wilt-Nematode Experiments at Lumberton, N. C., by A. L. Taylor, H. D. Barker, and O. P. Owens (U. S. D. A. and N. C. Sta.); Benefits of Winter Green Manure Crops in Controlling *Phymatotrichum* Root Rot of Cotton, by C J. King (U. S. D. A.); Relation of Variations in Rainfall in 1938 to Prevalence of Cotton Root Rot, and Girdling of Cotton Plants as Affecting Survival of *Phymatotrichum omnivorum*, both by W. N. Ezekiel (both Tex. Sta.); Attempts to Control *Verticillium* Wilt of Cotton and Breeding for Resistance, by B. A. Rudolph and G. J. Harrison (Calif. Sta. and U. S. D. A.); Permeability of the Testa of Normal and Treated Cotton Seeds, by J. G. Brown (Ariz. Sta.); Fungi Associated With Seedling Diseases and Boll Rots of Cotton in Eastern United States in 1938, by P. R. Miller, and Factors Influencing the Distribution and Persistence of the Angular Leaf Spot Diseases in Irrigated Cotton Fields, by C. J. King and R. B. Parker (both U. S. D. A.); Effect of Period and Type of Storage of Cotton Seed After Treatment With Organic Mercury Dusts, by L. E. Miles (Miss. Sta.); Seed Treatment Tests With Cotton in 1938, by D. C. Neal (U. S. D. A.); Seedling Survival as Affected by Certain Mercury, Copper, and Zinc Preparations Not Included in the Regional Cotton Seed Treatment Tests for 1938, by S. G. Lehman (N. C. Sta.); Variability of *Fusarium vasinfectum* Atk. in Culture, by R. Weindling (S. C. Sta. and U. S. D. A.); A Study of Virulence in Relation to Cultures of *Fusarium vasinfectum* Atk., by E. M. Cralley (Ark. Sta.); Some Tests of Varietal Susceptibility to a Combination of Nematodes and Cotton Wilt, by L. E. Miles (Miss. Sta.); Further Studies of Artificial Inoculation With the Cotton Wilt Fungus, *Fusarium vasinfectum* Atk., by D. C. Neal (U. S. D. A.); Progress in Soil Contamination Studies With *Fusarium vasinfectum* Atk., by A. L. Smith (Ga. Sta. and U. S. D. A.); Relation of Unbalanced Fertilization to the

Fusarium Wilt of Cotton, by V. H. Young and W. H. Tharp, and The Effects of Nitrogen Source, Nitrogen Level, and Relative Acidity on *Fusarium* Wilt of Cotton, and Effects of Nitrogen, Phosphorus, and Potassium Nutrition on the *Fusarium* Wilt of Cotton, both W. H. Tharp and C. H. Wadleigh (all U. S. D. A. and Ark. Sta.); and Treatment of Cotton Seed With Organic Mercury Dust and Sulphuric Acid, by G. J. Harrison (U. S. D. A.).

Abstracts of the papers presented before the Pacific Section of the Botanical Society of America, Stanford University, California, June 26 to 30, 1939 (*Amer. Jour. Bot., 26 (1939), No. 8, pp. 671, 674, 675*).—The following are of interest to plant pathology: How Does the Little Leaf Disease Affect the Meristem of Trees? by H. S. Reed, and A Study of the Perisporiaceae, Capnodiaceae, and Some Other "Sooty Molds" From California, by V. M. Miller (both Univ. Calif.).

Proceedings of the Association of Applied Biologists (*Ann. Appl. Biol., 26 (1939), No. 3, pp. 616–640*).—*In a symposium on testing and diseases of seeds,* the following papers were included: The Production, Handling, Testing, and Diseases of Seeds, by C. C. Brett (pp. 616–627); Notes on Seed Transmission of *Phoma lingam* in Relation to Dry Rot of Swedes in Scotland, by R. W. G. Dennis (pp. 627–630); Notes on *Pullularia pullulans* in Ryegrass Seed and Seed-Testing Methods as Affecting Detection of Certain Seed-Borne Diseases, by M. Noble (pp. 630–633); Hybridization in Brassicae and the Occasional Contamination of Seed Stocks, by V. McM. Davey (pp. 634–636); and Modern Methods of Seed Disinfection, by W. A. R. Dillon Weston (pp. 636–640).

Phytopathological studies by the Arizona Station] (*Arizona Sta. Rpt. 1938, pp. 65, 66, 67–71*).—Brief reports on the following are included: Tests of F_3 wheat crosses for resistance to smut, seed treatment for angular leaf spot of cotton, *Phymatotrichum* root rot problems (coop. U. S. D. A.), *Graphiola* leaf spot of date and other palms, bacterial slime (*Erwinia carotovora*) of lettuce, southern sclerotial rot (*Sclerotium rolfsii*), blight of citrus nursery stock, and dry root rot of citrus trees.

[Plant diseases at the New Hampshire Station] (*New Hampshire Sta. Bul. 313 (1939), pp. 16, 17, 18*).—Brief reports of progress are given on work with plant injuries due to lime-sulfur sprays and their amelioration, the relation of temperature to masking of potato mosaic, and spraying for apple scab, all by O. R. Butler; and mulching as it affects bitter pit in apples, by Butler and G. P. Percival.

Plant pathology [at the New Jersey Stations] (*New Jersey Stas. Rpt. 1938, pp. 79, 80, 81–85*).—Brief reports are given on the present status of apple spraying and cherry spraying tests; potato scab in relation to reaction of fertilizers and sources of nitrogen; potato spraying with types of bordeaux mixture; mercury soil and seed treatments for potato scab and *Rhizoctonia;* mercurial dip for sweetpotato scurf control, and dip for use just before removing from storage for shipment; diseases of vegetables, including cabbage club root control, cantaloup sprays and dusts, celery and eggplant wilts, lettuce yellows, mushroom diseases, nematode control, pea mosaic and root rot, pepper mosaic, sweet corn bacterial wilt, and tomato mosaic and seed disinfection; diseases of ornamental plants, including *Exobasidium burtii* infecting ericaceous shrubs, *Septoria obesa* leaf spot of chrysanthemums, *Spaeropsis ellisii* tip blight of conifers, *Phomopsis gardeniae* canker of gardenias, and diseases due to *Pestalotia* spp., *Colletotrichum* sp., and *Gloeosporium* spp.; and studies of the principles underlying the cause of copper fungicide injuries.

[Plant disease work by the North Carolina Department of Agriculture]. (Coop. U. S. D. A.). (*N. C. Dept. Agr. Bien. Rpt., 1937–38, pp. 21–24, 28, 60–62,*

63–65, figs. 3).—Brief reports of progress are included on white pine blister rust prevention, by H. B. Teague; phony peach and peach mosaic disease eradication, by J. A. Harris et al.; tobacco downy mildew; varietal studies of flue-cured tobacco for improvement of quality and disease resistance, by J. F. Bullock; Granville tobacco wilt, by T. E. Smith; and tobacco root knot, by K. J. Shaw.

Contribution toward a host index to plant diseases in Oklahoma, C. C. Brown (*Oklahoma Sta. Mimeog. Cir. 33* (*1939*), *pp.* [*5*]+*68*).—The author has attempted to bring together, in the form of a concise annotated check list, all available information on the occurrence, distribution, and importance of plant diseases in Oklahoma due to bacteria, fungi, seed plants, viruses, and environal conditions. The list, alphabetically arranged by Latin names, consists of records of 819 diseases of 284 species, including both crop and wild plants. It is believed that this preliminary and fragmentary outline may serve as a framework for further study of plant disease occurrence in the State.

Economic diseases of field crops in Manitoba, J. H. Craigie (*Canada Dept. Agr., Sci. Serv., Bot. and Plant Pathol. Contrib. 574* (*1939*), *pp. 37, figs. 22*).—The various diseases are discussed.

Annotated list of diseases of cultivated plants in Bermuda, J. M. Waterston (*Hamilton: Bermuda Dept. Agr., 1939, pp. X+38*).

A fungus disease of Arceuthobium, D. E. Ellis. (U. S. D. A. et al.). (*Phytopathology, 29* (*1939*), *No. 11, pp. 995, 996, fig. 1*).—Death of shoots induced by an imperfect fungus provisionally referred to *Fusarium* is reported for *A. campylopodum* and its forms and *A. douglasii*. Examination of herbarium material indicates that the disease may be widespread, and field observations show that the fungus exerts some measure of biological control in areas where it has become well established. The host-parasite relations and some of the cultural characters of the fungus are described.

Notes on parasitic seed plants with reference to Cuscuta, H. L. Dean (*Iowa Acad. Sci. Proc., 45* (*1938*), *pp. 89–94*).—A general review of the subject (18 references) in which approximately 2,000 species of 71 genera in 12 families of Angiosperms are said to be parasitic. Members of only two genera —*Cassytha* and *Cuscuta*—have the twining habit, and the latter group is the more widespread.

Fruit hypertrophy caused by Cuscuta, H. L. Dean (*Iowa Acad. Sci. Proc., 45* (*1938*), *pp. 95–97, fig. 1*).—Spontaneous cases on pods of garden peas and kidney beans are reported as due to *C. gronovii*.

Ecological aspects of host specialization in fungi, L. R. Tehon (*Ill. State Acad. Sci. Trans., 31* (*1938*), *No. 2, pp. 84–88*).—A general critical review.

Isolation of phytopathogenic Actinomycetes, G. KenKnight and J. H. Muncie. (Mich. Expt. Sta.). (*Phytopathology, 29* (*1939*), *No. 11, pp. 1000, 1001*).—According to this method, after surface disinfection with $HgCl_2$ and washing, diseased material (e. g., potato scab lesions) is triturated with a glass rod in a test tube and plated on an agar medium containing 1 gm. of glucose and 0.1 gm. each of $NaNO_3$, KCl, KH_2PO_4, and $MgSO_4.7H_2O$ per liter, adjusted to neutral pH. This medium is said to be selective for Actinomycetes, inhibiting a large number of other fungi and bacteria.

The perfect stage of Botrytis cinerea, J. W. Groves and F. L. Drayton (*Mycologia, 31* (*1939*), *No. 4, pp. 485–489, fig. 1*).—In this preliminary study, using about 70 isolates from various hosts and localities as a basis, the authors obtained mature apothecia belonging to the genus *Sclerotinia* from 9 isolates. Two methods of spermatization were used in obtaining them, viz, application of the spermatial suspension directly to the sclerotia, and using it to moisten

sterilized soil which was then placed over the sclerotia. Apothecia were obtained by both methods, but the second was deemed preferable, since the soil helped to prevent excessive drying and also reduced conidial production. The taxonomic significance of the development of these sclerotinioid apothecia by some of the common forms of *B. cinerea* cannot be properly evaluated at present, and hence no change in nomenclature is proposed. However, it is believed that work now in progress with single ascospore cultures will give some clue to the interpretation of the numerous variations observed and help to clarify the species concept in this perplexing group of fungi.

Chardoniella: A new genus of the Uredinales, F. D. KERN. (Pa. State Col.). (*Mycologia, 31 (1939), No. 4, pp. 373–375, fig. 1*).—*Chardoniella gynoxidis* n. g. and sp. (Pucciniaceae), the cause of a leaf rust on *Gynoxis* sp. in Colombia, South America, is described and illustrated.

An overwintering pycnidial stage of Cicinnobolus, C. E. YARWOOD. (Univ. Calif.). (*Mycologia, 31 (1939), No. 4, pp. 420–422, fig. 1*).—A pycnidial stage of *C. cesatii* was found on dead clover and cucumber leaves previously infected while living with the powdery mildews *Erysiphe polygoni* and *E. cichoracearum*, respectively, and the *Cicinnobolus*. This stage is apparently responsible for the overwintering of *C. cesatii* in nature.

New hosts and distribution of Elsinoë solidaginis, A. E. JENKINS, L. G. POLHAMUS, and H. H. HILL. (U. S. D. A.). (*Phytopathology, 29 (1939), No. 11, pp. 970–973, figs. 2*).—The new hosts given include *Solidago altissima*, *S. bicolor*, *S. brachyphylla*, *S. caesia*, *S. canadensis*, *S. juncea*, *S. rugosa*, *S. petiolaris*, *S. serotina*, *S. serotina gigantea*, and *S. ulmifolia*. *Brachychaeta sphacelata* is reported as the first host outside the genus *Solidago*. The new localities cited extend from Charleston and Walterboro, S. C., southward to Savannah, Ga., and include Jacksonville and Gainesville, Fla.

Mycelial habit in some species of Taphrina, A. J. MIX (*Mycologia, 31 (1939), No. 4, pp. 445–454, figs. 2*).—Eight species were found to develop mycelia within the outer wall of the host-epidermal cell and to produce ascogenous cells and asci in a wall locule. Six of these wall-inhabiting species parasitize ferns, and the other two occur on monocotyledons. Two of the species on ferns are described as new.

Host invasion in systemic infections of Uromyces caladii, S. M. PADY (*Mycologia, 31 (1939), No. 5, pp. 590–605, figs. 3*).—Dormant corms of jack-in-the-pulpit (*Arisaema triphyllum*) are said to be systemically infected by haploid mycelia of *U. caladii*. When growth begins in spring the leaves and flowers become infected, but the roots remain free. The rust mycelium is revealed by lesions on the upper leaf surface, from which the percentage of infection may be estimated. The mycelium invades all tissues of the spathe and spadix, and internal pycnia occur in the ovulate flowers, usually 5–8 per ovary and located in the ovary wall, placenta, funiculus, or ovule. The mycelium invades the ovule and the young embryo, suggesting the possibility of seed transmission.

Studies on the Ustilaginales of the world, G. L. ZUNDEL. (Pa. State Col.). (*Mycologia, 31 (1939), No. 5, pp. 572–589, figs. 3*).—In this presentation of the results of studies on specimens of smut fungi received from various countries, the author describes 15 new species under the genera *Xylosorium* n. g., *Ustilago*, *Sphacelotheca*, *Sorosporium*, *Tilletia*, and *Cintractia*.

Five new Zoopagaceae destructive to rhizopods and nematodes, C. DRECHSLER. (U. S. D. A.). (*Mycologia, 31 (1939), No. 4, pp. 388–415, figs. 5*).—*Euryancale sacciospora* n. g. and sp. and 2 new species each of *Stylopage* and

Cochlonema are described, increasing to 38 the number of species of the fungus family Zoopagaceae.

Plant viruses and virus diseases, F. C. Bawden (*Leiden, [Netherlands]: Chron. Bot. Co., 1939, pp. [10]+272, [pl. 1], figs. 37*).—In attempting to describe and correlate the advances recently made in the study of plant viruses, the author treats the subject under symptomatology (external and internal); transmission and properties in expressed sap; mechanism of insect-transmission, and relationships between viruses and their vectors; virus strains, mutation, and acquired immunity; serological reactions of plant viruses; purification of viruses; properties (including optical) of purified virus preparations; size of viruses; correlation of virus activity with the isolated nucleoproteins; physiology of virus-diseased plants; classification and control; and discussion on the origin and multiplication of viruses. References are given at the ends of chapters, and author and subject indexes are provided.

Investigations of the viruses of plants [trans. title], A. Gratia and P. Manil (*Arch. Gesam. Virusforsch., 1 (1939), No. 1, pp. 21–45, fig. 1*).—A comprehensive review of the subject is presented (45 references), with special reference to 17 communications by the authors.

Was Mayer the first to record a virus disease of plants? J. M. Raeder. (Idaho Expt. Sta.). (*Phytopathology, 29 (1939), No. 11, p. 1001*).—This is a note on an illustration, published between 1798 and 1808, which is said to present unmistakable evidence of "breaking" in tulips.

The value of the ultramicroscope for virus investigations [trans. title], H. Ruska, B. v. Borries, and E. Ruska (*Arch. Gesam. Virusforsch., 1 (1939), No. 1, pp. 155–169, figs. 14*).

Some observations in plants on the production of tumorous growths simulating those of cancer, M. M. Gallardo (*Univ. Philippines, Nat. and Appl. Sci. Bul., 7 (1939), No. 1, pp. 59–66, pls. 6*).—Following a brief review of the literature, the author presents observations on the production of tumorous outgrowths on various Philippine plants seeming to indicate that carcinogenesis may be caused by nutritional or metabolic disorders. In some cases the removal of parts of experimental plants is said to have caused the accumulation of excessive food or plastic substances giving rise to tumorous growths.

The causes and control of chlorosis in New Mexico, R. F. Crawford (*New Mexico Sta. Bul. 264 (1939), pp. 12, figs. 3*).—The chief factors said to cause chlorotic conditions of various ornamental plants and fruit and forest trees in New Mexico are fungus and virus diseases, stomatal plugging by dust, subnormal temperatures in early spring after foliation, lack or nonavailability of essential mineral nutrients, excess water, lack of oxygen and nitrogen in the soil, and lack of light. Mineral deficiency or unavailability are believed to be the most important causes of chlorosis in the State, and the trouble is said to be temporarily controlled by injecting, spraying, or treating the soil with iron salts. The most effective permanent treatment consisted in applying barnyard manure and adding iron and aluminum sulfates 1:1 at the rate of 1 lb. of the mixture to each inch in diameter of the plant. An acid solution of iron and aluminum sulfates is described which proved effective for chlorosis of American grape varieties and other plants.

Research on certain soil-borne diseases as affected by other microorganisms, G. B. Sanford (*Sci. Agr., 19 (1939), No. 10, pp. 609–615*).—The author discusses briefly some of the problems on soil-borne diseases as affected by antibiosis and related phenomena, including a review of some of the pertinent literature (21 references) and a summary of the results of work in Alberta by himself and associates as indicating the trend of recent progress in

this field and the questions which confront the pathologist in research on this group of diseases.

Relation of moisture to infection with some downy mildews and rusts, C. E. YARWOOD. (Univ. Calif.). (*Phytopathology, 29 (1939), No. 11, pp. 933–945*).—Inoculations with the downy mildews of onion, spinach, hop, and cucumber, and with the rusts of clover, bean, snapdragon, and sunflower, proved successful when dry spores were added to dry leaves followed by incubation of the plants in moist chambers at constant temperatures. Only in the case of the diseases due to fungi with a swarm-spore stage in the germination of their sporangia (mildews of hop and cucumber) was the infection markedly less when no water was added to the inoculated leaves than when the inoculated leaves were atomized. Maintaining inoculated plants in a dry soil during the moist-chamber period or using dried spores as inoculum had no marked effect on the results above noted, though in some cases these treatments reduced the amount of infection on unatomized leaves. More rust infection occurred on detached leaves of snapdragon, bean, and sunflower when the inoculated surface was faced downward during the incubation period. Onion leaves, either outdoors at night or in dark moist chambers, generally registered a lower temperature than that of the surrounding air, and this lower leaf temperature is believed primarily responsible for the moisture condensation on the leaves and the consequent favorable conditions for infection.

Associate committee on Trail smelter smoke, M. KATZ, A. W. MCCALLUM, G. A. LEDINGHAM, and F. E. LATHE (*Canada Natl. Res. Council Ann. Rpt., 21 (1938), pp. 117–122*).—This is a preliminary summary of comprehensive studies on the effect of sulfur dioxide on vegetation, including data on atmospheric SO_2, sulfur content of vegetation, symptoms and diagnosis of SO_2 injury, influence of certain factors on susceptibility, effect of SO_2 on conifers including the effect on diameter increment, and effects on yields of crop plants, on stomatal behavior, and on soils.

Observations on the chemistry of sulfur sprays, J. L. ST. JOHN and K. GROVES. (Wash. Expt. Sta.). (*Wash. State Hort. Assoc. Proc., 33 (1937), pp. 128–134*).—This is a review (one page of references) on the chemistry of sulfur sprays and on theories as to how sulfur compounds kill micro-organisms and insects.

Toluene compounds to control plant disease, H. HART and J. L. ALLISON. (Minn. Expt. Sta.). (*Phytopathology, 29 (1939), No. 11, pp. 978–981*).—In greenhouse tests, stem rust (*Puccinia graminis tritici* race 56) infection of Marquis, Ceres, and Mindum wheat varieties was reduced by applying *p*-toluenesulfonylamide (1 gm. per square meter) and *o*-toluenesulfonylamide (0.8 gm. per square meter) to the soil surface. This reduction was in percentage of infected plants and also in reaction type, and was somewhat more pronounced on sandy than on loamy soils. Picric acid applications reduced the rust infection only slightly, and sodium borate caused so much leaf-burning that the effect of the treatment was more severe than that of the rust infection. Although the costs and practicability of the toluene compound treatment for field crops are said to be still prohibitive, experiments are recommended with greenhouse crops and especially with ornamentals or other plants possessing high individual values.

Tear gas a three-way aid, P. A. YOUNG. (Tex. Expt. Sta.). (*South. Seedsman, 2 (1939), No. 8, pp. 7, 16, fig. 1*).—Nematodes, mold, and weeds are said to be controlled by soil treatment with chloropicrin.

The importance of standardized procedures in diluting liquid lime sulphur, H. W. THURSTON, JR., and D. E. H. FREAR. (Pa. Expt. Sta.). (*Phyto-*

pathology, 29 (1939), No. 11, pp. 993–995).—Chemical analyses showing the specific gravity and polysulfide and thiosulfate sulfur contents are presented for 30 samples of lime-sulfur concentrate, representing 8 commercial brands and 5 sources of home-boiled concentrate. statistical treatment of the data indicating specific gravity and polysulfide sulfur content to be well correlated. Since the fungicidal value is believed to depend on the amount of calcium polysulfides present, it thus appears that specific gravity is a fairly reliable index of this quality. A great difference in the thiosulfate sulfur content was found among the samples, but no correlation either with specific gravity or polysulfide sulfur content. With one exception the polysulfide sulfur content of the homemade solutions was far below that of the commercial brands. However, the superiority of this one exception indicates that with proper care and equipment lime-sulfur of a quality equal or superior to commercial brands may be produced on the farm.

Some cytological details of Ceresan poisoning in seedlings, J. E. Sass. (Iowa State Col.). (*Iowa Acad. Sci. Proc., 45 (1938), p. 99*).—An abstract.

A review of the investigations conducted in western Canada on root rots of cereals, P. M. Simmonds (*Sci. Agr., 19 (1939), No. 9, pp. 565–582*).—This analytical review (134 references) covers contributions from the United States and from other non-Canadian countries, and investigations in western Canada for three periods (1900–1920, 1921–30, and 1931–36) relative particularly to take-all root rot (*Ophiobolus graminis*), browning root rot (*Pythium* spp. and *Lagena radicicola*), and common root rot (*Helminthosporium sativum* and *Fusarium* spp.). During the last 10 yr. of comprehensive and cooperative studies these three major types of root rot have been defined and investigated, and "good control methods are available for one type and fairly satisfactory measures for a second type. The researches on the third or common root rot group are well advanced."

A method of inducing an epiphytotic of rust in grain breeding nurseries, S. J. Hadden. (Ga. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 8, pp. 728, 729, fig. 1*).—All alleyways and borders are sown with one drill width of a susceptible variety, and in early spring heavily infected plants from the greenhouse are transplanted at intervals in these areas, enclosed under cloth-covered frames, and watered on several successive days. Usually a very general prevalence of rust infection may thus be established in the breeding nursery while nearby fields show little or none.

Does "tulip root" in oats commonly arise from seed-borne infection? T. Goodey (*Jour. Helminthol., 17 (1939), No. 3, pp. 143–148*).—It is concluded from this study that although a few oat seeds may carry an occasional specimen of the stem nematode *Anguillulina dipsaci* inside the glumes, such eelworms are not viable and are incapable of setting up typical symptoms of tulip root in oat seedlings. The risk of spreading the disease by seed-borne infection is deemed probably so slight as to be negligible from the practical standpoint.

Retention of virus by its insect vectors through several generations, T. Fukushi (*Imp. Acad. [Japan] Proc., 15 (1939), No. 5, pp. 142–145, figs. 5*).—In this preliminary report the author notes that during the past 5 yr., in two experiments each, transmission of the rice dwarf virus through eggs of the leafhopper vector to progeny of the third and fourth generations was obtained, as well as one test in which it was perpetuated to the seventh. In certain cases female leafhoppers noninfective throughout their lives produced infective progeny, a tentative explanation correlated with the known relation to temperature in the host plant being that multiplication of the virus was

etarded and localized so that no virus reached the salivary glands but was present in the ovarion tubules. There appeared to be no reduction in virulence by retention of the virus through several generations, since a majority of the infective leafhoppers of the sixth generation induced infections in each 50–80 plants on which they had been confined individually for a day.

Physiologic races of wheat leaf rust involved in the 1938 epiphytotic, C. S. CHESTER and C. JAMISON. (Okla. Expt. Sta.). (*Phytopathology, 29 (1939), No. 11, pp. 962–967*).—Analysis of 98 collections of *Puccinia rubigo-vera tritici* from Oklahoma in the 1938 epidemic indicates the principal races involved to have been, in decreasing order of prevalence, 13, 19, 77, and 9. Races 13, 19, and 9 are believed to be variants of the same race, their slight reaction differences being largely due to environal effects on the sensitive Carina and Hussar varieties. Similarly, races 5 and 15 are considered variants of the same race. Race 77, which was occasionally identified, is believed to be potentially dangerous on account of its extensive equipment with the capabilities to overcome many resistant factors in wheat. At present, however, it does not compete successfully with races 13, 19, and 9, which equally well infect commercial wheats and have a slightly shorter incubation period. Of 60 wheat varieties of superior germ plasm inoculated with races 13, 19, 9, 77, 5, and 2, both individually and collectively, a number showed resistance to one or more. The two showing the greatest resistance from seedling stage to maturity were the hybrids Kawvale × Marquillo and Hope × Hussar.

Interaction of soil micro-organisms with Ophiobolus graminis Sacc., the fungus causing the take-all disease of wheat, A. LAL (*Ann. Appl. Biol., 26 (1939), No. 2, pp. 247–261, figs. 2*).—A systematic study in plate cultures of the interaction between *Ophiobolus* and various soil contaminants isolated showed varying degrees of interference with its growth, and these data are described and tabulated. The effects of the living contaminants could, to some extent, be reproduced by their metabolic products. Tests with wheat seedlings planted over *Ophiobolus* mycelium, with or without the simultaneous presence of the various contaminating organisms, showed that the antibiotic influences varied from no appreciable effect to complete inhibition of attack. On this basis the various organisms are divided into three groups.

Two new fungi on legumes, L. R. TEHON (*Mycologia, 31 (1939), No. 5, pp. 537–543, figs. 6*).—*Placosphaeria medicaginis* n. sp. parasitizing alfalfa leaves and *Catosphaeropsis caulivora* n. g. and sp. causing lesions on the stems of *Lespedeza* are described and illustrated.

Preliminary observations on a kernel discoloration in inbred and hybrid lines of dent corn, A. J. ULLSTRUP. (Ind. Expt. Sta. and U. S. D. A.). (*Phytopathology, 29 (1939), No. 10, pp. 905–907, fig. 1*).—At harvest time (1938) an unusual discoloration of the kernel crowns in inbred and hybrid lines of dent corn was observed, the color ranging from light tan to medium brown, in some cases extending a short distance down the kernel faces. Germination tests indicate no loss of viability from this condition. Platings of kernels on agar media adjusted to various pH levels, together with histological examination, failed to indicate any pathogenic association with fungi or bacteria, and the cause remains unknown. Histological sections showed the aleurone layer to be absent in these discolored areas.

Diplodia ear rot in Illinois cornfields, G. H. BOEWE (*Ill. State Acad. Sci. Trans., 31 (1938), No. 2, pp. 92, 93*).—A brief summary of *D. zeae* ear rot incidence from 1928 to 1937, inclusive, with tabulation.

Effect of type and period of storage on cotton seed after treatment with organic mercury dusts, L. E. MILES. (Miss. Expt. Sta.). (*Phytopathology,*

29 (1939), No. 11, pp. 986–991).—Cottonseed treated with Ceresan (3 oz. per bushel) and New Improved Ceresan (2 oz. per bushel) and then stored 1, 2, 3, 4, and 5 mo. dry in the laboratory and in a ventilated corncrib in the open showed, when sown the following year, no significant difference in either emergence or yield as a result of storage under these conditions. Similar results were obtained with seed after 17 mo. of storage. However, irrespective of the type or period of storage, the effects of the seed treatments themselves up to the 17-mo. limit of the tests were highly significant. After storage periods up to 5 mo., the average increase in emergence for seed treated with Ceresan over the controls was 25.1 percent and for New Improved Ceresan 24.6 percent, while the average increases in yield were 24.5 and 26.4, respectively. Results at least equally significant were obtained after 17 mo. of storage. It is thus indicated that cottonseed may be treated at any time after harvest with organic mercury dusts and stored for periods at least up to 17 mo. without injurious effects from the fungicide and without decreasing its beneficial effects.

The pathogenic action of Phymatotrichum omnivorum, G. M. and M. O. Watkins. (U. S. D. A.). (*Science, 90 (1939), No. 2338, pp. 374, 375*).—Pure cultures of the root rot fungus were maintained in successive transfers on roots of living cotton seedlings. A fragment of infected root placed against the root of a healthy seedling, usually caused, within a few hours, shrinking and discoloring of the uninfected tissues, followed by the formation of an enveloping and penetrating hyphal weft, which then produced soft cortical decay. Drops of liquid squeezed from unheated, decayed roots and placed on healthy roots frequently imparted a water-soaked appearance to the host tissue which after 24 hr. began to shrink and turn yellow to light brown, forming sunken, necrotic, usually girdling cortical areas. Tissue destruction, however, did not appear to extend beyond the endodermis, and abundant cell division in the pericycle initiated the formation of lateral roots. Liquid expressed from heated decayed roots usually produced only a slightly discolored spot with no considerable shrinkage or disruption of tissue. Unheated and heated liquid expressed from germinating sclerotia gave results closely parallel to those obtained with heated and unheated root extracts. The chemical action found is of interest in connection with biochemical studies of the basis of resistance to *P. omnivorum* in certain plants.

Some tests of varietal susceptibility to a combination of root-knot nematode and cotton wilt, L. E. Miles. (Miss. Expt. Sta.). (*Phytopathology, 29 (1939), No. 11, pp. 974–978*).—Tests of 17 varieties of upland cotton and of 14 varieties and strains of introduced cottons and their hybrids were conducted (1938) on land heavily infested with both *Fusarium vasinfectum* and *Heterodera marioni*, plats of one 25-ft. row being used with 8 replications. Of the upland cottons, 8 varieties (Clevewilt 6, Cook 144–68, Cook 307, Dixie Triumph 55–85, Toole (Perry), Sykes W. R., Dixie 14–5, and Dixie Triumph 12) showed the highest resistance to wilt and, as a group, relatively lower nematode infestation. A group intermediate in wilt resistance and somewhat more heavily infested by nematodes consisted of the varieties Rowden 2088, Missdel W. R., D. & P. L. 11A, Miller 610, and Carolina-del No. 2. The varieties Coker 100, Washington, Half and Half, and Missdel No. 4 were extremely susceptible to both parasites when grown on infested soil. Sea Island 13B3 showed no trace of wilt at any time, and also had the lowest incidence of nematode-infested plants among the entire 31 varieties and strains represented in the tests. Another Sea Island strain, Andrews, showed 9.61 percent of wilt and a relatively high incidence of nematodes. One strain of Hopi, designated as Hopi 6 No. 2 (Sacaton), showed only 9.73 percent of wilt, while another strain, Hopi M 34–6–2, from the same locality, showed 100 percent of wilt. The first showed 98.07 percent of nematode infestation and

the latter 100 percent. Of the five crosses between Acala and Hopi, one showed only 23.52 percent of wilt, another 64 percent, and the remaining three 100 percent, while all five were extremely susceptible to nematode infestation.

Choanephora cucurbitarum attacking cowpeas, C. L. LEFEBVRE and J. L. WEIMER. (U. S. D. A. and Ga. Expt. Sta.). (*Phytopathology, 29 (1939), No. 10, pp. 898–901, figs. 2*).—During 1937 a fungus identified as *C. cucurbitarum* was found causing a decay of the pods of Groit cowpeas at Experiment, Ga., 5 percent of the pods in one field being affected. In 1938 the fungus was again found rotting cowpea pods, but due to the extremely dry summer it caused very little damage on the nine affected varieties. Inoculation tests showed the fungus capable of attacking the green as well as the more mature pod tissues. Under the oil-immersion objective the sporangiospore walls showed very fine longitudinal striations. Heretofore the fungus has been observed commonly as a saprophyte on leaves of various grasses collected in Georgia and Florida, when incubated in moist chambers.

The influence of twelve chemical elements on the state of health of the potato plant [trans. title], D. A. VAN SCHREVEN (*Meded. Landbouwhoogesch. Wageningen, 43 (1939), No. 1, pp. [2]+166, pls. 22, figs. 2; Eng. abs., pp. 126–132*).—In this monograph the author reviews the literature (15 pages of references) and describes and discusses the results of his investigations on the deficiency and excess diseases of the potato plant in relation to K, P, N, Ca, Mg, Mn, Fe, B, Cu, Zn, Na, and Cl. Special reference is made to the forms of these troubles found in the Netherlands.

Late blight resistance in potato varieties as reflected in yields, F. J. STEVENSON. (U. S. D. A. and Maine Expt. Sta.). (*Amer. Potato Jour., 16 (1939), No. 9, pp. 229–232*).—Comparing the yield and quality data on sprayed and nonsprayed potatoes in Presque Isle, Maine, tests in 1937 and 1938, it is indicated that under the late-blight conditions of 1937 it would not have paid to spray Katahdin, Sebago, or the remaining five resistant varieties, and Green Mountain was the only one of the eight varieties tested that needed protection. On the other hand, in 1938 spraying would have been profitable on all the varieties in the test. In breeding of potatoes resistant to *Phytophthora infestans* it is important to compare yields of the new and standard varieties under both sprayed and nonsprayed conditions in the field, but these tests illustrate the facts that the prevalence of blight depends very materially on weather conditions and that these vary from season to season.

The appearance of weaker variants in the Cs strains of potato X-virus [trans. title], E. KÖHLER (*Arch. Gesam. Virusforsch., 1 (1939), No. 1, pp. 46–69, figs. 7*).—It is shown that a virulent strain of potato X-virus (designated Cs 36) can be induced to form weaker variants when raw plant sap containing the virus is heated up to the limit for inactivation. However, the same procedure used on a weaker strain (Cs 35) from which the virulent one had arisen apparently gave no such results. The variants of these two strains differed in part only quantitatively, but in part also qualitatively, from the parent strains. All the Cs strains thus far appearing (derived from the variant Cs A) may be provisionally arranged on a four-point scale as to virulence. On the bases of earlier work by the author and the results of serological and physicochemical investigations certain views are presented as to the possible structure of the virus molecule.

A discussion of nica rot, bacterial rot, or ring rot, C. L. FITCH (*Iowa State Hort. Soc. [Rpt.], 73 (1938), pp. 373–375*).—This is a summary of discussions of potato ring rot at the meetings of the American Association for the Advancement of Science at Richmond, Va., December 1938.

A study of viruses causing yellow mosaics in European and American varieties of the potato, Solanum tuberosum, T. P. Dykstra. (U. S. D. A.). (*Phytopathology, 29 (1939), No. 11, pp. 917–933, figs. 7*).—Using different varieties of American and European potatoes and other solanaceous plants, and on the basis of such tests as serological reaction, protective inoculation, determination of physical properties, and symptoms and general disease behavior, the author studied aucuba mosaic, Canada streak, tuber blotch, pseudo-net necrosis, and calico. The last two were found to be identical, while Canada streak, a newly described disease causing necrotic blotches in tubers of all varieties tested, is considered a distinct strain of aucuba mosaic. The aucuba mosaic group is said to include aucuba mosaic, pseudo-net necrosis or tuber blotch, and Canada streak. No natural relationship was found between the viruses of this group and the calico virus. No evidence was obtained that either tuber blotch or Canada streak occurs in the United States.

Yellow dwarf of potato in Wisconsin, J. C. Walker and R. H. Larson. (Wis. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *59 (1939), No. 4, pp. 259–280, figs. 6*).—In discussing the symptomatology of yellow dwarf under Wisconsin conditions, one important phase not previously reported is the nonemergence of plants from infected seed tubers. A temperature-relation study indicated that the top symptoms develop most rapidly and severely at high air temperatures and may be entirely suppressed at 16° C. (60.8° F.). Low soil temperatures favored germination and emergence from infected tubers and tended to suppress the top symptoms, while high soil temperatures tended to prevent emergence and to hasten the appearance of top symptoms. The "poor-stand" phase in the field was associated with high soil temperatures during the period. With respect to the sporadic appearance in epidemic form, it is shown that the greatest amount of dissemination in 1937 was in the eastern part of Portage County in central Wisconsin where the clover leafhopper was most prevalent, but no field evidence of spread by the potato leafhopper or aphids was secured. A study (1932–38) of contiguous low-disease and high-disease areas showed no correlation between red clover plantings and yellow dwarf epidemics. It thus appears that other sources of inoculum are more important in central Wisconsin. Russet Burbank tended to escape infection in a section of central Wisconsin where 18 other varieties or strains became heavily infected during the epidemic of 1937.

Black root of sugar beets in the Puget Sound section of Washington, L. Campbell (*Washington Sta. Bul. 379 (1939), pp. 14, figs. 2*).—Although the damping-off diseases of sugar beet commonly designated as black root have been variously ascribed in the literature to some 5 fungus species, extensive studies over 2 yr., involving 31 different fungi isolated by numerous cultures from affected beet roots throughout the Puget Sound district, yielded only one proving pathogenic. This form was met with frequently, identified as *Phoma betae*, and proved capable of causing black root. It is carried in the seed balls and is believed to have been introduced into the section on seed balls of German origin. None of the treatments tested gave any significant control where the soil was heavily infested, but where black root was not severe enough to be of economic importance some protection against the preemergence stage was indicated by 2 percent Ceresan or New Improved Ceresan. Until some method of controlling the postemergence stage is found, a system of crop rotation, together with Ceresan seed treatment, is recommended. The general use of domestic seed in this section is expected to be an important factor in control, since this seed has not been found to carry the *Phoma*.

Alternate hosts of B. vascularum: The causal agent of gumming disease of sugar cane, C. G. Hughes (*Queensland Bur. Sugar Expt. Stas. Tech. Commun.*

(1939), pp. [1]+35–63, pl. 1, figs. 11).—The author discusses the history, cause, and symptoms of this sugarcane disease, and presents the results of experimental work indicating that *Bacterium* (=*Phytomonas*) *vascularum* is capable of infecting corn, all varieties of sweet and grain sorghums tested, and Sudan, Para, Johnson, and elephant grasses. Except for the white palm, it is said there is thus far no record of the spontaneous occurrence of this disease in hosts other than sugarcane. However, the facility with which positive results were obtained on inoculation of these selected plants and, relative to sugarcane, the atypical nature of the symptoms induced in most cases both suggest the inadvisability of widespread planting of highly susceptible varieties in a once infested area.

On the molecular weight of the tobacco mosaic virus protein, V. L. Frampton. (Cornell Univ.). (*Science, 90 (1939), No. 2335, pp. 305, 306, figs. 2*).—The author briefly reviews previous methods of determining the molecular weight of this virus protein and presents data, including formulas, based on a diffusion study, using the refractory method of O. Lamm,[4] of a sol containing 0.87 percent electrodialyzed protein dispersed in distilled water.

Accumulation of virus of tobacco mosaic in plants when nitrogen is withheld from them, V. L. Rischkov and V. A. Smirnova (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 23 (1939), No. 1, pp. 95–97*).—The authors report that when nitrogen was withheld from tomato plants attacked by tobacco mosaic the production of virus continued, and its titer in the juice of starving plants was not lowered as compared to controls. The diseased plants were much more badly affected by cutting off the nitrogen supply than the healthy plants. The virus of tobacco mosaic is characterized as "parasitic protein."

Dealers can control black rot: Cabbage disease, seed borne, would be eliminated by proper immersion, G. H. Godfrey. (Tex. Expt. Sta.). (*South. Seedsman, 2 (1939), No. 8, pp. 8, 18, fig. 1*).—The author summarizes Texas experiences and general information regarding this serious bacterial disease, stressing the importance and efficacy of the standard mercuric chloride seed treatment.

A hybrid cucumber resistant to bacterial wilt, S. P. Doolittle, F. S. Beecher, and W. S. Porte. (U. S. D. A.). (*Phytopathology, 29 (1939), No. 11, pp. 996–998, fig. 1*).—The Tokio Long Green cucumber is said to have shown marked tolerance to cucumber virus 1 (mosaic) and some resistance to *Bacillus tracheiphilus*. Several of its crosses with standard varieties exhibited high mosaic tolerance, one of which, Tokio Long Green × Vickery Forcing, though not highly tolerant to mosaic proved definitely resistant to bacterial wilt. Selections from this cross have produced lines showing only 18–32 percent wilt as compared with 74 percent in the moderately susceptible White Spine controls and 100 percent in highly susceptible foreign varieties. Progress of the bacteria in resistant plants is said to be definitely retarded, while in older resistant plants many primary infections fail to become systemic. This hybrid is not yet entirely satisfactory in horticultural type, but the fruit is of fair quality.

Notes on hop diseases for 1939, R. O. Magie (*Farm Res. [New York State Sta.], 5 (1939), No. 4, p. 6, fig. 1*).—Freedom from downy mildew and black mold is reported. Hop yields were reduced by drought injury, and further reductions were caused by leafhoppers, powdery mildew, and by borers. Nicotine sulfate spray applied soon after the middle of June or bordeaux mixture used three times beginning June 10 prevented the leafhopper injuries. The importance of applying sulfur for protection against powdery mildew is stressed,

[4] Ztschr. Phys. Chem., Abt. A, 138 (1928), No. 5, pp. 313–331, figs. 8.

sprays proving more effective than dusts. In a varietal planting differences in both leaf and cone resistance to this mildew are reported as very striking.

Lettuce mosaic, G. C. AINSWORTH and L. OGILVIE (*Ann. Appl. Biol., 26 (1939), No. 2, pp. 279–297, pls. 2*).—Previous records of lettuce mosaic are cited, and the symptoms are described, together with the variation in reaction of different varieties of head lettuce. The host range is extended to include certain composite weeds and legumes. The virus was carried over in ±6 percent of the seeds tested. From the insect tests reported it is concluded that the aphid *Myzus persicae* is not the principal vector in Great Britain, and that the conditions under which field transmission occurs require further study. The influence of the weather is discussed, certain properties of the virus are described, and control measures are suggested.

Fumigation of mushroom houses with hot formaldehyde gas from outside vaporizer for control of undesirable fungi (*Agr. News Letter, 7 (1939), No. 8–9, pp. 77, 78*).—"By use of this means of fumigation, together with other sanitary measures, control of 'unfriendly fungi'—such as truffles and Mycogone—is obtained at low cost."

Experiments and observations on a virus disease of winter spinach (Spinacia oleracea), I. F. STOREY (*Ann. Appl. Biol., 26 (1939), No. 2, pp. 298–308, pl. 1*).—The causal agent is said to be identical with Ainsworth's cucumber mosaic virus 1 (E. S. R., 74, p. 502). The disease is most prevalent in the earlier sown crops and this appears to be correlated with their liability to infestation by aphids.

A technique for studying host resistance and pathogenicity in tomato Fusarium wilt, F. L. WELLMAN. (U. S. D. A.). (*Phytopathology, 29 (1939), No. 11, pp. 945–956, figs. 2*).—In the laboratory-greenhouse technic described for studying the pathogenicity of *Fusarium bulbigenum lycopersici* and the relative wilt resistance of tomato strains and varieties, a prepared sand-soil mixture, autoclaved before each trial, is used. The seedlings are grown in sterilized soil for 4–6 weeks, and the inoculum is from liquid cultures of the fungus. At inoculation the roots are washed, dipped in inoculum, and planted. The temperatures maintained are 25°–28° C. for the soil and 24°–30° for the air. The plants are carefully watered to avoid excessively dry or wet conditions. In the tests made the time required for growing plants in test beds to obtain fungus-host reactions averaged about a week. A system for numerical disease evaluation is described and diagrams are presented. By this method it is possible to classify increasing severity of disease by increasing numbers from 0, no apparent infection, to 15, the earliest death from *Fusarium* infection. Repeated trials have indicated this technic to be dependable for determining the relative resistance or susceptibility to wilt of tomato strains and the relative virulence of fungus strains.

Some factors contributing to tomato puffing, J. J. TAUBENHAUS and G. E. ALTSTATT. (Tex. Expt. Sta.). (*Plant Physiol., 14 (1939), No. 3, pp. 575–581*).—This fruit defect is said to cause annual losses of 8–15 percent of the Texas tomato crop, affected fruits being light in weight, angular, flat-sided, and more or less hollow. Puffing begins in the embryonic stage, and progresses to the most prominent symptoms in the fully developed fruit. The cause is unknown, but the evidence here obtained appears to indicate it not to be due to a microorganism or a virus, not to be soil- or seed-borne, nor influenced by other diseases or by soil acidity. It is influenced by soil moisture and probably by certain fertilizers and some other environal conditions. Irrigated plants produced a higher percentage of puffed fruits than plants without irrigation.

Success with canning crops (*Utah Agr. Col. Ext. Cir. 98, n. ser. (1939), pp. 29*).—This compendium contains information on Utah canning crop produc-

ion and research needs, by various authors, including Cultural Practices in Tomato Curly-Top Control, by M. Shapovalov (U. S. D. A.) (pp. 18, 19); and Protection of Tomatoes From the Beet Leafhopper, by H. E. Dorst (pp. 20, 21), Searching for Curly-Top Resistant Tomatoes in Utah and in South America (pp. 21–23) and Status of Tomato Wilt and Canker Control (pp. 27–29) (both by H. L. Blood) (all U. S. D. A. and Utah Expt. Sta.).

Diseases of fruits and hops, H. WORMALD (*London: Crosby Lockwood & Son., 1939, pp. 290, pls. 40, figs. 24*).—"The object of this book is to enable the grower to recognize the various disorders that affect his fruit and hops, and to provide information that will help him to control them. It therefore aims at describing symptoms rather than the organisms causing the diseases, but brief descriptions of the parasites and their habits are given so that the measures advocated may be understood." The foreword is by G. H. Pethybridge.

Some types of injury to apples and pears from spraying and washing, F. L. OVERLEY and E. L. OVERHOLSER. (Wash. Expt. Sta.). (*Wash. State Hort. Assoc. Proc., 33 (1937), pp. 143–152, figs. 10*).—The authors discuss calyx end injury due to soluble arsenic and washing treatments, spot-type arsenical injury, acid injury from chemicals used in the washing solution, lenticel injury usually appearing after washing and heat injury from washing of apples, and moisture loss from washed and unwashed pears.

Blight of pears, apples, and quinces, J. W. ROBERTS (*U. S. Dept. Agr. Leaflet 87 (1939), pp. 4, fig. 1*).—An informational pamphlet summarizing data on the cause, overwintering, and control of bacterial blight of pome fruits.

Control of rots of apples, F. D. HEALD (*Washington Sta. Pop. Bul. 158 (1939), pp. 8*).—A summary of information on the blue and gray molds, black rots, and anthracnoses affecting apples in storage in the Pacific Northwest, including data on their avenues of entrance into the fruit and their prevention or reduction to the lowest possible minimum injury.

Scab control and spray russet on apple, L. PIERCE. (U. S. D. A.). (*Hoosier Hort., 21 (1939), No. 5, pp. 69–72, fig. 1*).—Results of the 1938 tests indicated the importance of timely application of fungicides during early spring to prevent primary apple scab infection, and that a mixture of wettable sulfur and lime-sulfur may be substituted for the full-strength lime-sulfur formula in general use against scab.

Toxicity of the sodium salt of dinitro-o-cresol to Venturia inaequalis, G. W. KEITT. (Univ. Wis.). (*Science, 90 (1939), No. 2328, pp. 139, 140*).—Applied in the spring in small-scale experiments by spraying overwintered apple leaves bearing abundant mature ascocarps of the apple scab fungus, a proprietary preparation, Elgetol, containing 12 percent of this chemical, with a penetrating agent added and used at 1 percent by volume in water, reduced ascospore discharge by 99.7 percent. Toximetric studies indicated that the lethal concentration of Elgetol to the fungus in agar plate cultures was near 1 in 2,000. Further experiments were in progress to determine whether the material has practical possibilities as an eradicant fungicide for apple scab control.

Small fruit troubles, R. F. SUIT (*Farm Res. [New York State Sta.], 5 (1939), No. 4, p. 2*).—New York State data for 1939 are briefly summarized for winter injury, mosaic, wilt or bluestem, and spur blight of raspberries; black rot and mildew of grapes; leaf spot of currants; leaf spot and powdery mildew of gooseberries; and winter injury, root rot, leaf spot, and red stele disease (reported on three farms) of strawberries.

Is Blakemore "yellows" an infectious disease? J. A. MCCLINTOCK. (Purdue Univ.). (*Hoosier Hort., 21 (1939), No. 8, pp. 121–123, fig. 1*).—While the studies reported give no concrete evidence that this yellows is due to a transmissible virus, they do not minimize the importance of this disease in the strain of the

Blakemore strawberry variety grown at Purdue University, and evidence presented indicates that affected plants are being perpetuated by propagation from runner plants.

Further light on the nature and cause of psorosis of citrus trees, A. S. Rhoads. (Fla. Expt. Sta.). (*Citrus Indus., 20 (1939), No. 6, pp. 11, 12, 14*).—This is a review and progress report on the virus-induced psorosis. Since the disease may remain quiescent for several years before the bark symptoms develop, it is deemed advisable not to select budwood promiscuously from young trees of unpedigreed origin as they may be carrying the infection in a latent state. If all propagators would follow this precaution it is believed that this pernicious disease could soon be largely eradicated.

Résumé of four years spraying of Schley pecans with bordeaux mixture to control the scab disease, J. R. Cole and J. R. Large. (U. S. D. A.). (*Southeast. Pecan Growers Assoc. Proc., 33 (1939), pp. 24–35, figs. 4*).—The Stuart, Teche, and Moore varieties are said to be very resistant to pecan scab (*Cladosporium effusum*), which is a limiting factor in nut production for such susceptible varieties as Delmas, Alley, Schley, Pabst, Van Deman, and Success. Sanitary measures, such as knocking off old shucks and leaves from the trees and plowing them under are material aids in controlling this disease, but for commercial control (85–90 percent) a prepollination application of bordeaux mixture (4–1–100) followed by three stronger (6–2–100) treatments prove necessary on the susceptible varieties.

Bacterial leaf spot of Dieffenbachia, L. McCulloch and P. P. Pirone. (U. S. D. A. and N. J. Expt. Stas.). (*Phytopathology, 29 (1939), No. 11, pp. 956–962, fig. 1*).—A yellowish-brown leaf spot of *D. picta* is shown to be due to *Bacterium dieffenbachiae* n. sp., which is fully described together with the symptoms induced. The bacteria were found to enter the leaf tissue through the stomata.

Chlorosis studies in Michigan, K. K. Kreag (*Trees Mag., 2 (1939), No. 4, pp. 13, 15, 16*).—In a study in Lansing, Mich., the soil solutions of four soils on which chlorotic shade trees were growing showed a calcium content of from 250 to 660 p. p. m., while iron was too low to be indicated by the test outfit. In the solution from soils upon which healthy trees were growing, calcium varied from 100 to 150 p. p. m. and the iron was 10 p. p. m. or slightly over. When sprayed from one to three times between July 11 and August 1 with a ferrous sulfate and glue solution pin oaks and red oaks showed the quickest recovery, while red maple and white oak also responded readily but more slowly. Best results are reported from spraying leaves before they ceased growing.

Chlorosis of shade trees in Lansing, Michigan, 1938, K. K. Kreag (*Arborist's News, 4 (1939), No. 10, pp. 73–77*).—Recovery of the normal green color in chlorotic foliage of six tree species (including oaks, maples, and hackberry) is reported for all but the last species following spray treatment with iron salts.

Verticillium albo-atrum, cosmopolitan tree parasite, J. C. Carter (*Ill. State Acad. Sci. Trans., 31 (1938), No. 2, pp. 89–91, figs. 6*).—It is noted that since the Illinois Natural History Survey began its intensive study of tree diseases in 1931, this fungus has been cultured from diseased parts of 12 species of trees and shrubs, of which *Catalpa speciosa*, *Robinia pseudoacacia*, and *Viburnum lantana* are believed to be new hosts. The symptoms of infection on various hosts and the cultural characters of the fungus are described.

Sterile conks of Polyporus glomeratus and associated cankers on beech and red maple, W. A. Campbell, and R. W. Davidson. (U. S. D. A. et al.). (*Mycologia, 31 (1939), No. 5, pp. 606–611, figs. 2*).—Observations and illustrations are included on decay and cankers due to *P. glomeratus* and on the associated sterile conks of the fungus on beech and maple in New England and Pennsylvania.

Bacterial leaf spot of maple, P. A. Ark. (Univ. Calif.). (*Phytopathology, 29 (1939), No. 11, pp. 968–970, fig. 1*).—Nursery seedlings of *Acer macrophyllum* in Berkeley, Calif., were attacked on the leaves by a bacterium here described as *Phytomonas aceris* n. sp. The leaf spots were at first water-soaked, surrounded by a yellow zone but later turning dark brown or black. In serious cases, the petioles and brackets may develop cankers. Cool, damp weather favored the disease. *A. circinatum*, *A. negundo*, *A. negundo californicum*, and *A. palmatum* contracted the disease on artificial inoculation.

A leaf blight of Populus tacamahaca Mill. caused by an undescribed species of Linospora, G. E. Thompson. (Univ. Ga.). (*Canad. Jour. Res., 17 (1939), No. 7, Sect. C, pp. 232–238, pl. 1, figs. 2*).—This disease, caused by *L. tetraspora* n. sp., is known to occur in Alberta, British Columbia, Ontario, and Quebec, Canada. The leaf lesions vary in size and are dark-colored with very irregular and diffused margins. Leaves may become completely invaded, discolored, and prematurely dropped, and small, circular or irregular pseudoclypei develop on the upper surfaces, but no true conidial stage was found. Spermatia are produced in acervuli developing in the cells of the upper epidermis during late summer and fall. Isolations from ascospores and plantings of diseased tissues gave similar mycelial growth in culture, and the pathogenicity of the fungus was demonstrated by ascospore inoculations and reisolations.

A canker disease of poplars caused a new species of Neofabraea, G. E. Thompson. (Univ. Ga.). (*Mycologia, 31 (1939), No. 4, pp. 455–465, figs. 3*).—A canker disease of *Populus grandidentata*, *P. tacamahacca* (*balsamifera*) and *P. tremuloides* found in Ontario, Canada, is shown to be due to *Neofabraea populi* n. sp., with conidial stage belonging to the form genus *Myxosporium*. Cultures derived from ascospores, conidia, and tissue plantings were similar. Optimum growth occurred at ±18° C., though some took place at 3° and 27°. Apothecia developed in corn meal agar cultures, both single and polysporic isolations producing them in ±45 days at 15°.

The biology of Stereum gausapatum Fries, J. A. Herrick (*Ohio State Univ., Abs. Doctoral Diss., No. 28 (1938), pp. 167–173*).—This abstract deals with a fungus parasite said to be the most important organism causing basal decay in oaks of sprout origin throughout the eastern part of the United States. Although oak is its common host, it has also been reported on maple, water-beech, beech, chestnut, apple, hornbeam, poplar, alder, birch, and ash.

The growth of Stereum gausapatum Fries in relation to temperature and acidity, J. A. Herrick. (Ohio Expt. Sta. and Univ.). (*Ohio Jour. Sci., 39 (1939), No. 5, pp. 254–258*).—This fungus was grown on potato dextrose and malt agars at constant temperatures of 5°–35° C. Very little growth occurred at either extreme, and the optimum was at 25°. Culturing the fungus on potato dextrose agar, considerable growth occurred at pH 2.8–7.6, the optimum was ±4.6, and growth was inhibited at pH 2.2 and 8. No indication of an isoelectric point was obtained. See also a previous note (E. S. R., 81, p. 390).

Notes on North American pine-oak species of Cronartium on Castanea, Castanopsis, and Lithocarpus, G. G. Hedgcock. (U. S. D. A.). (*Phytopathology, 29 (1939), No. 11, pp. 998–1000*).—The known occurrence of species of *Cronartium* on species of *Castanea* in nature in the United States, China, and Japan is given, with a list of the results of inoculations of 14 host species in the genera *Castanea*, *Castanopsis*, and *Lithocarpus* with 5 species of *Cronartium* (*C. cerebrum*, *C. conigenum*, *C. fusiforme*, *C. strobilinum*, and *Cronartium* sp.) at Washington, D. C.

Spongy white rot of hardwoods (Fomes connatus (Weimann) Gillet), P. Spaulding. (U. S. D. A., New England and N. Y. Expt. Stas., et al.). (*Mass.*

Forest and Park Assoc., Tree Pest Leaflet 38 (1939), pp. [4], figs. 3).—An informational leaflet, including suggested control measures.

Immunity of a staminate clone of Ribes alpinum from Cronartium ribicola, G. G. Hahn. (U. S. D. A. et al.). *(Phytopathology, 29 (1939), No. 11, pp. 981–986, fig. 1)*.—The dioecious mountain currant, which is becoming popular as an ornamental in the Middle West, has been reported as both immune and susceptible to *C. ribicola*. These apparently conflicting reports prompted the investigation of a male clone at the Marsh Botanical Garden, Yale University, and of a female clone at the Arnold Arboretum, Harvard University. Thorough testing of these plants in parallel proved the male clone to be immune and the female susceptible. *Ribes* controls, known to be susceptible, inoculated to establish the viability of the inoculum and the suitability of the environal conditions, likewise became infected. These results are said to corroborate earlier findings by Clinton and McCormick (E. S. R., 52, p. 647), who discovered but did not emphasize a difference in rust-susceptibility between the two sexes of this plant.

Cedar blight on wilding and forest tree nursery stock, W. C. Davis and D. H. Latham. (U. S. D. A. et al.). *(Phytopathology, 29 (1939), No. 11, pp. 991, 992)*.—Isolations of *Phomopsis juniperovora* from native red cedars of various ages, and failure to find infection in two nurseries with no native cedars in the vicinity, confirmed the contention that nursery-grown red cedars may become infected from blighted native cedars. An increased incidence was also associated with seedbed fertilization with a 4–10–4 commercial fertilizer or with $(NH_4)_2SO_4$.

On the structure of the cyst wall of Heterodera schachtii (Schmidt), M. T. Franklin *(Jour. Helminthol., 17 (1939), No. 3, pp. 127–134, pl. 1)*.—A detailed morphological and cytological study of the cysts of this plant-parasitic nematode.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Bio-ecology, F. E. Clements and V. E. Shelford *(New York: John Wiley & Sons; London: Chapman & Hall, 1939, pp. [VII]+425, figs. 85)*.—This work is presented in 10 chapters, an appendix, and a bibliography of 36 pages.

[Contributions on wildlife research and management] *(U. S. Dept. Agr., Bur. Biol. Survey, Wildlife Res. and Mangt. Leaflets BS–138 (1939), pp. 3; BS–139, pp. 2; BS–140, pp. 19)*.—Further contributions in this series (E. S. R., 81, p. 668) are as follows: Sperm Studies as a Guide in Fur-Animal Breeding Practice, by R. K. Enders (BS–138); Rabbit-Pen Construction in Relation to Sore Hocks, by G. S. Templeton (BS–139); and A Survey of the Annual Fur Catch of the United States (BS–140).

Transactions of the Fourth North American Wildlife Conference *(Washington, D. C.: Amer. Wildlife Inst., 1939, pp. IX+644, figs. [52])*.—The proceedings of the Fourth North American Wildlife Conference (E. S. R., 80, p. 365), held in Detroit, Mich., February 1939, appear in two parts, the first containing the general sessions (pp. 1–200) and the second the special sessions (pp. 201–644). Contributions from the State experiment stations include the following: Inventory Methods for Mearns Cottontail, by G. O. Hendrickson (pp. 209–215) (Iowa, U. S. D. A., et al.); Increasing Fish Production in Ponds, by H. S. Swingle and E. V. Smith (pp. 332–338) (Ala.); Suggestions for Appraising Effects of Predation on Local Areas Managed for Bobwhite, by P. L. Errington (pp. 422–425) (Iowa, U. S. D. A., et al.); and Censusing Ringneck Pheasants in Pennsylvania, by P. E. Randall and L. J. Bennett (pp. 431–436) (Pa., U. S. D. A., et al.).

Faunal relationships and geographic distribution of mammals in Oklahoma, W. F. Blair (*Amer. Midland Nat., 22 (1939), No. 1, pp. 85–133, fig. 1*).

Food habits of prairie dogs, L. H. Kelso (*U. S. Dept. Agr. Cir. 529 (1939), pp. 15*).—The results of laboratory examinations of 543 stomachs of 3 species of North American prairie dogs, including 247 of the black-tailed (*Cynomys ludovicianus*), 169 of the white-tailed (*C. leucurus*), and 127 of the Gunnison (*C. gunnisoni*), are reported, the details being given in table form. These animals are of importance as direct competitors of sheep and cattle for forage on western range land. The findings have corroborated the general belief that these rodents feed almost entirely on vegetation since 97.47 percent of the total food of the 3 species was derived from plants. The examinations led to the finding that roots, stems, and leaves predominate over seeds and fruits in their diet to a greater extent than is the case with most other rodents. Plants of forage or crop value were not the only ones eaten, although such plants averaged 78.32 percent of the total food of the 3 species.

A parasitological reconnaissance in Alaska with particular reference to varying hares.—II, Parasitological data, C. B. Philip (*Jour. Parasitol., 24 (1938), No. 6, pp. 483–488*).—This second contribution (E. S. R., 81, p. 669), based upon a field survey in Alaska in June 1937, includes a table showing the number of varying hares with parasites, and a second table giving host parasitic data on other than varying hares. Of 172 varying hares taken at various places in Alaska, 29 carried larval tapeworms (*Taenia pisiformis*), 16 were infested by adult *Cittotaenia pectinata americana*, and 4 were infested by both species. The nematode *Passalurus nonannulatus* was recovered once. Ectoparasites included the rabbit tick and the flea *Hoplopsyllus glacialis lynx*. Laboratory studies of the rabbit tick, limited by paucity of material, revealed the presence of tularemia in the Territory for the first time, and also suggested the possible occurrence of low-grade type of Rocky Mountain spotted fever.

Bats, G. M. Allen (*Cambridge, Mass.: Harvard Univ. Press, 1939, pp. X+368, [pls. 29], figs. [26]*).—The life history and bionomics of bats, their geographic distribution, and relation to disease are dealt with in this work of 21 chapters and a bibliography of 14 pages.

A comparison of spring migrations of some birds through Clay and Palo Alto Counties, Iowa, J. B. Low. (Iowa Expt. Sta., U. S. D. A., et al.). (*Iowa State Col. Jour. Sci., 13 (1939), No. 2, pp. 187–200*).

The birds of the Malay Peninsula: A general account of the birds inhabiting the region from the Isthmus of Kra to Singapore with the adjacent islands.—IV, The birds of the low-country jungle and scrub, F. N. Chasen (*London: H. F. & G. Witherby, 1939, vol. 4, pp. XXVI+487, pls. [26]*).—This further volume (E. S. R., 76, p. 357) is illustrated by 25 full-page plates in color.

Notes on the food habits of certain Maryland lizards, R. H. McCauley. (Cornell Univ.). (*Amer. Midland Nat., 22 (1939), No. 1, pp. 150–153*).—A report is made of the stomach contents of individuals of five of the six species of lizards known to occur in Maryland. It is certain that these lizards within certain limits are practically omnivorous, although they appear to have certain preferences.

The principles of insect physiology, V. B. Wigglesworth (*London: Methuen & Co., 1939, pp. VIII+434, figs. 316*).—The subject of insect physiology is presented in 15 chapters, each accompanied by a copious list of references to the particular subject under discussion.

[Contributions on economic insects] (*Anat. Rec., 72 (1938), No. 4, Sup., pp. 108, 109, 110, 131, 132, 133, 134*).—Abstracts of contributions on insects pre-

sented at the annual meeting of the American Society of Zoologists, December 1938, include: Hydrogen-Ion Concentration of Insect Blood, by R. D. Boche and J. B. Buck (pp. 108, 109); Bactericidal Activity of "Royal Jelly" of the Honeybee, by C. S. McCleskey and R. M. Melampy (p. 110) (La. State. Univ. and U. S. D. A.); Development of Eggs of the Japanese Beetle (*Popillia japonica* Newman) Near the Threshold Temperature (p. 131), Number of Eggs in Oothecae of Two Introduced Species of Asiatic Mantids [*Tenodera* spp.] and the Proportion Hatching (p. 131), and *Podagrion mantis* Ashmead, an Egg Parasite of Introduced Asiatic Mantids (p. 132), all by H. Fox; Food Specificity of Grasshoppers, by F. B. Isely (p. 132); and The Life Cycle of the Tyroglyphid Mites Infesting Cultures of *Drosophila melanogaster*, by S. G. Stolpe (pp. 133, 134).

[Work in economic zoology and entomology] (*Arizona Sta. Rpt. 1938, pp. 45, 46*).—The work of the year (E. S. R., 79, p. 502) includes range rodent investigations, the effect of climate on the olive parlatoria *Parlatoria oleae*, the watermelon midge *Itonida citrulli* and other insects, and the control of aphids by their natural enemies.

Connecticut State entomologist, thirty-eighth report, 1938, W. E. Britton. (Partly coop. U. S. D. A.). (*Connecticut [New Haven] Sta. Bul. 428 (1939), pp. 122, figs. 16*).—This report of the late author (E. S. R., 80, p. 573) first considers the entomological features of 1938 (pp. 5–22), including an insect record for the year arranged according to crops, etc., attacked, followed by a brief reference to the program of the annual conference of the Connecticut entomologists held in October (E. S. R., 79, p. 358) and reports on control, including the inspection of nurseries, by Britton and M. P. Zappe (pp. 24–33), and of apiaries, by Britton (pp. 34–40), control of the gypsy moth, by Britton, J. T. Ashworth, and O. B. Cooke (pp. 41–49), the European corn borer, by Britton, Zappe, and N. Turner (pp. 50–53), Japanese beetle, by J. P. Johnson (pp. 53–58), the present status of mosquito control, by R. C. Botsford (pp. 58–64), and parasite work, by P. Garman (pp. 65–68).

Accounts are given of tests of apple sprays, by Zappe and E. M. Stoddard (pp. 68–71); field experiments in control of the apple maggot, 1938, by Garman (pp. 72, 73); continued experiments with stickers, by Garman and C. E. Shepard (pp. 74, 75); use of karaya gum as an activator for nicotine sulfate against *Aphis rumicis* (p. 76) and control of the oriental fruit moth in peaches and quinces (pp. 77–79), both by Garman; report of a survey of elm bark beetle population in western Connecticut in 1938, by B. J. Kaston and D. S. Riggs (pp. 80–88); notes on the occurrence and life history of *Ochrosidia borealis* Arrow in Connecticut, by Johnson (pp. 89–91); rodent control, by R. Isaac (pp. 92–98); an outbreak of the elm spanworm in Connecticut, 1938, by G. H. Plumb and R. B. Friend (pp. 98–102); some after effects of the hurricane, by Friend (pp. 102, 103); and effect of salt water spray on foliage, by Zappe, Johnson, and Stoddard (pp. 103–105).

Under miscellaneous insect notes (pp. 105–112) are included damage by the furniture beetle *Anobium punctatum* DeG., *Hexarthrum ulkei* Horn in buildings, hayfield damaged by Asiatic beetle [oriental beetle] *Anomala orientalis* Waterh., notes on the Asiatic garden beetle (*Autoserica castanea* (Arrow)), notes on the hairy chinch bug (*Blissus hirtus* Montandon), the European earwig in Connecticut, control of rose chafers on peaches, results of trapping rose chafers, the forest [tent] caterpillar (*Malacosoma disstria* Hübner), and the European pine shoot moth (*Rhyacionia buoliana* (Schiff.)).

[Contributions on economic insects] (*Iowa State Hort. Soc. [Rpt.], 73 (1938), pp. 139–148, 251–260, 395–409, figs. 7*).—Contributions relating to economic

insects in these transactions of the Iowa State Horticultural Society and affiliated societies for 1938 include the following: Orchard Insects of 1938, by C. H. Richardson and H. Gunderson (pp. 139–147) (Iowa Expt. Sta.); Some Important Shade Tree Insect Pests in Iowa, by H. D. Tate (pp. 251–260) (Iowa State Col.); *Promising New Honey Plants*, by *F. C. Pellett* (pp. 395–400); and Results of Iowa's 1937 and 1938 Honeybee Disease Resistance Program, by O. W. Park, F. C. Pellett, and F. B. Paddock (pp. 401–409) (Iowa Sta.).

The history of entomology at the Massachusetts Agricultural College, 1867–1930, H. T. FERNALD (*Mass. State Col., Fernald Club, Spec. Pub. No. 1 (1938), pp. [2]+53+[2], fig. 1*).—This historical account includes a list of entomological publications issued at the Massachusetts Experiment Station in annual reports, bulletins, special and technical bulletins, and circulars.

[Work in entomology by the New Hampshire Station] (*New Hampshire Sta. Bul. 313 (1939), p. 22*).—In reporting upon the work of the year (E. S. R., 79, p. 504) brief reference is made to a study of contact insecticides which included an investigation of the rate of penetration of oils through insect integument, by W. C. O'Kane, J. G. Conklin, L. C. Glover, and R. L. Blickle; and the initial rate of penetration of various glycerides, terpenes, and hydrocarbon oils for the eggs of the American roach, Mexican bean beetle, Colorado potato beetle, and the larger milkweed bug.

[Work in economic zoology and entomology by the New Jersey Stations] (*New Jersey Stas. Rpt. 1938, pp. 24–27, 30–33, 38–47*).—Work of the year (E. S. R., 79, p. 357) with oysters reported includes the production of oyster seed, open shore and claire culture of oysters, the control of oyster drills, and studies of the filtration of water by oysters and of the factors which influence it. Entomological work includes that with blueberry insects (the blueberry maggot and the cranberry weevil) and cranberry insects (commercial control of the blunt-nosed leafhopper *Euscelis striatulus* Fall., effect of presence of dew on the efficiency of pyrethrum dusting, new material for leafhopper dusting (E. S. R., 80, p. 229), and the false yellowhead *Sparganothis sulfureana* Clem. (E. S. R., 79, p. 511)); mosquito investigations and control (E. S. R., 79, p. 367; 81, p. 549); climate and insect investigations; orchard insect investigations; insecticidal investigations (studies of lime-sulfur-lead arsenate sprays (E. S. R., 80, p. 799), new insecticides involving organic and inorganic chemicals, *Cracca virginiana* (commonly know in the South as devil's shoestring), and studies of new wetting and spreading agents to be used instead of soap in various insecticides) (E. S. R., 79, p. 505); vegetable insect investigations (the corn earworm, European corn borer (E. S. R., 79, p. 367), parsley stalk weevil, aster leafhopper, cabbage maggot, onion maggot, and the pea aphid); investigations of soil-infesting insects, bees, and of insects injurious to ornamental plants; and termite control in wooden structures buried in the soil by means of arsenate of lead as an agent to mix with the soil.

[Contributions on economic entomology] (*Ztschr. Angew. Ent., 24 (1937), Nos. 1, pp. 1–156, figs. 66; 2, pp. 161–306, figs. 17; 3, pp. 325–447, figs. 59; 24 (1938), No. 4, pp. 461–653, figs. 66*).—The contributions here presented (E. S. R., 78, p. 217) include:

No. 1.—Contributions to the Knowledge of the Pest Fauna of Asia Minor [Anatolia]—V, Some Little-Known Minor Pests of the Sugar Beet in Turkey, by P. Steiner (pp. 1–24) (E. S. R., 78, p. 218); Quantitative Field Studies of the Sawflies Attacking *Pinus banksiana*, With Particular Reference to Methods Employed, I, by K. E. Schedl (pp. 25–70); "Detal" Dusting Against the Pine Geometrid *Bupalus piniarius* L., by B. A. Marcus (pp. 71–86); Investigations of the Change in Sex Ratio in the Nun Moth *Lymantria monacha* L. and Its

Causes, by H. Brandt (pp. 87–94); A Critical Note on the Importance of Insect Parasites of the Nun Moth, by J. Komárek (pp. 95–117), with an index to and descriptive tables for their identification by S. Kolubajiv (pp. 102–117); The Possibilities of Spread of the Nun Moth *Lymantria monacha* L. Through the First-Instar Larvae, by A. Hundertmark (pp. 118–128); The Biology and Control of the Codling Moth (*Carpocapsa pomonella* L.), by K. Küthe (pp. 129–144); The Races and Species Question Investigated in *Papilio machaon* L. (Lep., Rhop.), by K. Eller (pp. 145–149); Two Hitherto Unknown Species of Bloodsucking Diptera of the Genus *Haphospatha* Enderlein From Central Europe (Diptera, Stomoxydidae), by F. Peus (pp. 150–154); and Concerning the Contribution of B. Germar, "Experimental Control of the Granary Weevil With Dust Insecticides," by G. Kunike (pp. 155, 156) (E. S. R., 78, p. 218).

No. 2.—The Control of the Silver Fir Aphid *Dreyfusia nüsslini* C. B. (= *nordmannianae* Eckst.), by C. Hofmann (pp. 161–180); Quantitative Field Studies of the Sawflies Attacking *Pinus banksiana*, With Particular Reference to Methods Employed, II, by K. E. Schedl (pp. 181–125) (see above); The Influence of Environment on the Population of Mites and Collembola in the Soil, by E. Schimitschek (pp. 216–247); The Danger to Silkworms of Arsenical Poisons, by H. Prell (pp. 248–267); The Economic Importance of the Red Ant *Myrmica rubra laevinodis* Nyl., by K. Hölldobler (pp. 268–276); Observations on the Control of the Larvae of *Tipula paludosa* Meig. and *T. czizeki* De J., by K. Sellke (pp. 277–284); A Giant Colony of the Red Forest Ant *Formica rufa* L., by H. J. Stammer (pp. 285–290); and Some Observations on the Quantitative Investigation Methods of Calculating Bark Beetle Infestations, by I. Trägårdh and V. Butovitsch (pp. 291–306).

No. 3.—The Lupine Leaf Weevils *Sitona griseus* F. and *S. gressorius* F., by K. T. Andersen (pp. 325–356); Experimental Investigations of the Influence of Temperature and Humidity on the Growth of the Larvae of *Hylotrupes bajulus* L., by K. Schuch (pp. 357–366); Ants and Aphids: A Contribution to the Ecology of Aphidophilous Ants, by J. Herzig (pp. 367–435); and The Surface Structure of the Eggs of Moths as an Identification Character, by R. Lehmensick and R. Liebers (pp. 436–447).

No. 4.—The Honeydew Question and the Honeydew-Producing Aphids of Conifers (Cinarini), by R. Braun (pp. 461–510); The Control of Elateridae (A Review of the Literature [1,046 titles]), by W. Subklew (pp. 511–581); A Contribution to the Biology of the Microlepidoptera (Investigations of *Plodia interpunctella*), by R. Lehmensick and R. Liebers (pp. 582–643); Corrodentia in the Beehive, by Z. Örösi-Pál (pp. 644–646); *Cassida vittata* Villers (glossy-striped tortoise beetle) as a Beet Pest in Bayern (pp. 647, 648) and The Mealy Plum Aphid *Hyalopterus arundinis* in central Switzerland (pp. 648–651), both by C. Hoffmann; and Cynipidae as Parasites of Insects, by K. Escherich (pp. 651–653).

Report of the division of entomology for the year ending 31st December, 1938, J. K. Chorley (*Rhodesia Agr. Jour., 36 (1939), No. 8, pp. 598–622*).

[Lists of publications on Indian entomology, 1934 and 1935] (*Imp. Council Agr. Res. [India], Misc. Buls. 7 (1935), pp. 36; 14 (1937), pp. 40*).—These lists are in continuation of those previously noted (E. S. R., 74, p. 513).

Animal pests (*Expt. and Res. Sta., Cheshunt, Herts, Ann. Rpt., 24 (1938), pp. 64–86*).—Observations of the more important pests of nursery, greenhouse, and garden crops are reported by E. R. Speyer, O. B. Orchard, and W. H. Read.

Field crop entomology, D. B. Whelan (*Lincoln, Nebr.: [Author], 1938, [pp. 56, figs. 77]*).—An illustrated text on the main facts relating to the chief pests of corn, small grains, and forage crops.

Cover crops and their relation to citrus insects, J. R. Watson. (Fla. Expt. Sta.). (*Citrus Indus., 20 (1939), No. 7, pp. 10, 11*).

Some factors affecting pecan yields, G. H. Blackmon. (Fla. Expt. Sta.). (*Southeast. Pecan Growers Assoc. Proc., 33 (1939), pp. 14–16, 18, 20–23*).

Principles of forest entomology, S. A. Graham (*New York and London: McGraw-Hill Book Co., 1939, 2 ed., pp. XVI+410, figs. [166]*).—In this revision of the work previously noted (E. S. R., 61, p. 355), new information has been added concerning various forest insects, especially those that have recently become economically important.

Study of some forest insects of Nanking and its vicinity, I, II, C. P. Miao (*Sci. Soc. China, Biol. Lab. Contrib., Zool. Ser., 12 (1937), No. 8, pp. 131–181, figs. 27; 13 (1938), No. 2, pp. 9–22, fig. 1, Chin. abs., p. 20*).—The results of investigations of several lepidopterous insects causing damage to shade trees in Nanking and its vicinity, in which their life histories, habits, habitats, seasonal appearance, food plants, and relationship to environment were studied, are reported. Particular attention is given to the morphology of the several stages of these pests, including *Labeda nobilis* Walk., *Bhima idiota* (Graes), *Papilio xuthus* L., and the lappet moth *Metanastria ampla* Walk. Bibliographies with 46 and 37 references, respectively, are included.

Injuries to plants caused by insect toxins, W. Carter. (Hawaii. Pineapple Prod. Expt. Sta.). (*Bot. Rev., 5 (1939), No. 5, pp. 273–326*).—This review of literature on the subject of injuries to plants caused by insect toxins is presented with 257 references.

The control of household insects in South Africa, B. Smit (*Union So. Africa Dept. Agr. and Forestry Bul. 192 (1938), pp. 52, figs. 20*).—A practical account.

Notes on entomogenous fungi, T. Petch (*Brit. Mycol. Soc. Trans., 23 (1939), pt. 2, pp. 127–148, figs. 8*).—A continuation of studies (E. S. R., 81, p. 72), in which 28 additional forms are dealt with, 11 being described as new.

Agricultural products as insecticides, R. C. Roark. (U. S. D. A.). (*Indus. and Engin. Chem., 31 (1939), No. 2, pp. 168–171, figs. 4*).

Derris: Effects of sunlight and rain on derris deposits as studied in the laboratory, R. D. Chisholm and L. D. Goodhue. (U. S. D. A.). (*Soap, 14 (1938), No. 12, pp. 117, 119, 131*).

The position of combined washes in the post-dormant spray programme, I, II, H. G. H. Kearns and H. Martin (*Sci. Hort. [Wye, Kent, Eng.], 7 (1939), pp. 96–118, pls. 2*).—Part 1 of this contribution deals with the physical properties of spray fluids with special reference to post-dormant washes (pp. 96–104) and part 2, the use of post-dormant combined washes in fruit crops (pp. 105–117). A list of 27 references to the literature is included.

An international termite exposure test—tenth progress report, G. M. Hunt and T. E. Snyder. (U. S. D. A.). (*Amer. Wood-Preservers' Assoc. Proc., 35 (1939), pp. 350–361*).—The results obtained from the chemical treatment of wood specimens when exposed to the activities of termites are considered in this progress report. It is based upon data submitted by J. Zetek from Barro Colorado Island, Canal Zone, Panama, H. B. Wilson and T. Greaves from Australia, D. T. Fullaway and Q. C. Chock from the Territory of Hawaii, and N. B. Eckbo from South Africa.

Tillage operations as affecting grasshoppers, J. A. Munro (*North Dakota Sta. Bimo. Bul., 2 (1939), No. 1, pp. 3–5, figs. 3*).—Trials at the Edgeley and Langdon Substations have shown soil tillage to have an important bearing on grasshopper control. Work designed to test the effects of different types of spring tillage operations, including plowing, disking, and duckfooting, on sub-

sequent grasshopper development was commenced in the spring of 1939. Of these types moldboard plowing ranked first as an aid in grasshopper control. The plowing served to bury most of the egg pods below their normal level in the soil and prevented the grasshoppers from reaching the surface. The turning of the eggs under to the lower levels by plowing not only delayed hatching but prevented most of the young from reaching the surface, as was evidenced by the fact that comparatively few grasshoppers were found on the surface of the plowed soil at any time. The one-way disking, or disk plowing, rated second to moldboard plowing for preventing grasshopper development. This implement, sometimes referred to as the "wheatland plow," did not bury the egg pods as well as the moldboard plow but proved quite satisfactory for destroying weed growth and other vegetative cover. It is concluded that disk plowing, so far as spring tillage is concerned, is decidedly unsatisfactory for preventing grasshopper development. The results obtained by duckfooting varied widely. A large hatch followed this type of cultivation, but grasshopper development was greatly affected by the amount of vegetative growth which followed.

[Contributions on grasshoppers in the Union of South Africa] (*Union So. Africa Dept. Agr. and Forestry, Sci. Buls. 176 (1938), pp. 30, figs. 8; 181 (1938), pp. 12, figs. 2; 186 (1938), pp. 51, pl. 1, figs. 38; 189 (1939), pp. [2]+81, figs. 20; 190 (1939), pp. 143, figs. 34*).—Contributions relating to grasshoppers in South Africa are as follows: Nos. 176, Investigations on the Red Locust *Nomadacris septemfasciata* (Serv.) in Portuguese East Africa and Nyasaland in 1935, by A. Lea; 181, Locust Outbreaks in the Union During the Season 1936–37, and 186, The Influence of Weather Conditions on the Incipient Swarming of the Brown Locust *Locustana pardalina* (Walker), both by C. du Plessis; 189, Field Observations on the Red Locust [*Nomadacris septemfasciata* (Serv.)] at Lake Rukwa in 1936 and 1937, by A. Lea and D. van V. Webb; and 190, Field Observations on the Brown Locust [*Locustana pardalina* (Walker)] in An Outbreak Centre, by C. J. B. Smit.

Test methods on roaches, E. N. Woodbury. (Ohio State Univ.). (*Soap, 14 (1938), No. 8, pp. 86–90, 107, 109, figs. 6*).—A report on the German cockroach as a test insect for liquid petroleum insecticides.

The control of banana rust thrips, N. E. H. Caldwell (*Queensland Dept. Agr. and Stock, Div. Plant Indus. (Res.) Bul. 16 (1938), pp. [3]+73, figs. 9*).—A report of studies of the life history and bionomics of the banana rust thrips *Scirtothrips signipennis* Bagn., its distribution, population, epidemics, injury to banana plant, and control measures.

The Hinds collection of Thysanoptera, S. F. Bailey. (Univ. Calif.). (*Pan-Pacific Ent., 15 (1939), No. 2, pp. 91–93*).—A brief report is made of the author's study of the W. E. Hinds collection of Thysanoptera, included in which are 19 of the new species described by Hinds.

Appearance of a new potato disease in northeastern Colorado, L. B. Daniels. (Colo. Expt. Sta.). (*Science, 90 (1939), No. 2334, p. 273*).—A brief account is given of a new disease of the potato, resembling psyllid yellows but caused by the feeding of Say's stinkbug, that was brought to the station's attention on July 20 [, 1939,] by farmers in Morgan County, Colo., where it was of general occurrence in the medium-early and late plantings. This pentatomid was found associated with the disease in every case of the several hundred plants examined. Cage experiments commenced at the Greeley Potato Experiment Station on July 31 with plants known to be free of psyllid and disease demonstrated that this stinkbug, feeding on the plants, is definitely responsible for the condition. "Medium-early plantings show 15 to 20 percent of diseased plants, while many late plantings in the Greeley area show 50 to 60 percent

of pentatomid-affected plants. The feeding may cause a complete wilting of the leaves or tips of the plants. Where the feeding is confined to the stems of the lower part of the plants, the symptoms become more general. Associated with the feeding is a basal curling of the terminal leaves, a yellowing followed by a reddish discoloration along the margin, and an erect condition of the affected foliage. The tubers may be produced in chains or, in the more mature tubers, serious bumpiness and malformation may occur. The number of insects on each plant determines the severity of the disease. In the Morgan County area an average of 11 adult insects was found on each plant. Plants attacked by 3 or 4 insects were only mildly affected, while those on which there were 19 or 20 adult insects showed extreme symptoms."

Plant bug cause of new potato disease, L. B. DANIELS (*Colo. Farm Bul.* [*Colorado Sta.*], *1* (*1939*), *No. 4, pp. 16, 17*).—This report supplements the account of the appearance of a new potato disease in Morgan and Weld Counties in 1939 above noted. The symptoms of feeding were of two types, the first, a common tip wilting in which the insect had fed on a single small terminal branch. The entire cluster of leaves drooped and wilted from the point of feeding to the tip, then the leaves shriveled up, turned brown, and died. The second type, the most severe and the most injurious, appeared in those cases where a number of plant bugs had fed nearer the base of the plant for a time—on the branches or on a single large branch. While resembling psyllid yellows the symptoms differ in that the lower leaves do not have the tendency to become heavy and leathery. As the season progressed and the toxic effect of the pentatomid attack was reduced by the maturing of the bugs and their more even distribution through the field the plants showed some recovery. In control work five applications of lime-sulfur failed to check the condition.

Hickory capsids found to injure peaches, E. H. SMITH (*Farm Res.* [*New York State Sta.*], *5* (*1939*), *No. 4, pp. 8, 10, fig. 1*).—Injury to peaches in western New York by the hickory capsid has been increasing in importance during the past few years. This dark brown or black insect measuring about one-fourth inch in length is present on all species of hickory but is more abundant on the shagbark hickory. Its eggs are laid in the terminal bud of the hickory where they pass the winter and hatch the following spring. The nymphs feed on the tender buds where they are quite inconspicuous. After passing through four stages they become adults about the first week in June. They soon fly to nearby peach trees and by the first week of July have disappeared. Their injury is caused by puncturing young peaches during the last 3 weeks in June. This results in the dropping of severely attacked fruits; the less severely attacked become marred by "cat-facings" and gummy exudations and in some cases are not marketable. As much as 50 percent of the fruit in some orchards may be injured in this manner. Eradication of hickory trees in the vicinity of the orchard is considered to be the simplest and surest means of control; if not destroyed, spraying during the last 3 weeks in June must be resorted to. The cost of labor and materials, however, make it impracticable to apply more than two sprays in addition to the regular spray program. The best results have been secured from materials that leave a heavy residue on the fruit and foliage. Lime and sulfur, 25 lb. each per 100 gal. of water, have given promising control. The first spray should be applied as soon as the first capsids appear on the peaches, with the second spray applied 10 days later.

Three new species of Tingitidae (Hemiptera) from Australia, C. J. DRAKE. (Iowa State Col.). (*Pan-Pacific Ent.*, *15* (*1939*), *No. 2, pp. 87, 88*).

New species of Psyllidae from the western United States, L. D. TUTHILL (*Iowa State Col. Jour. Sci.*, *13* (*1939*), *No. 2, pp. 181–186*).—Twelve new species

representing the genera *Aphalara*, *Aphalaroida*, *Calophya*, *Trioza*, and *Psylla* are described.

The citrus blackfly: A third pest eradicated from Florida, W. NEWELL and A. C. BROWN (*Citrus Indus.*, *20* (*1939*), *No. 4*, *pp. 18, 19, 22*).—An account is given of the control and eradication work with the citrus blackfly, commenced in August 1934, when it was discovered at Key West. Its eradication from the key was completed and the quarantine lifted on April 13, 1938.

Investigations on the resistance of mealybugs (Homoptera) to parasitization by internal hymenopterous parasites, with special reference to phagocytosis, H. A. BESS. (Calif. Citrus Expt. Sta.). (*Ann. Ent. Soc. Amer.*, *32* (*1939*), *No. 1*, *pp. 189–226*, *figs. 9*).—In studies conducted during the fiscal year 1935–36, several thousand parasites and parasitized mealybugs were under observation with a view to determining the degree of resistance of the different host species, when the destroyed parasites die, and the relation of phagocytosis, if any, to resistance. It is concluded that host specificity, insofar as oviposition is concerned, depends upon the attractiveness of the hosts to the female adults and not upon the suitability of the hosts as media for the development of their progeny. Differences in the developmental rate of a parasite within different hosts, as well as the resistance of these hosts, may be due in part to the favorability of the host fluids as nutriment. The unsuitability of a resistant or immune host as a developmental medium for a specific parasite may be due to something (enzyme, etc.) lacking or possessed by the parasite rather than something lacking or possessed by the host. "Apparently the stimulus which initiates phagocytosis of the parasite eggs in *Ps*[*eudococcus*] *gahani* and *P. maritimus* is associated in some way with the development of the parasite larvae within the eggs. There is some evidence, although not conclusive, that phagocytosis of the parasite eggs in these species was initiated by chemical substances liberated about the time of hatching." Neither phagocytosis, character of surface of parasite, hosts inadequate as food, nor melanization alone appears adequate to explain how immunity is realized. The data presented are considered to show that immunity is not necessarily accompanied by phagocytosis.

Aphis species infesting Ribes (Homoptera: Aphidae), M. W. ALLEN and G. F. KNOWLTON. (Utah Expt. Sta.). (*Ann. Ent. Soc. Amer.*, *32* (*1939*), *No. 1*, *pp. 125–130*, *figs. 48*).—Descriptions are given of the alate and of the apterous vivipara of seven species of aphids of the genus *Aphis* which feed upon currants and gooseberries, namely, *A. grossulariae* Kltb. from Cambridge, England, *A. neomexicana* Ckll. from Colorado and Utah, *A. ribiensis* Gill. and Palmer from Utah, *A. ribi-gillettei* K. and A. from Utah, *A. ribis* Sanborn from Missouri, *A. sanborni* Patch from Illinois and Pennsylvania, and *A. varians* Patch from Utah, Idaho, Colorado, and Oregon. *A. ribi-gillettei*, described as new, was collected from within curled terminal leaves of currants (usually yellow currants) and gooseberries (*Ribes* sp.) in several localities in Utah.

Dormant and delayed dormant sprays for the control of rosy apple aphids and scale insects, W. S. HOUGH (*Virginia Sta. Bul. 322* (*1939*), *pp. 31*, *figs. 9*).—The results of orchard experiments with various spray ingredients used in the dormant or delayed dormant stage of apple against the rosy apple aphid, San Jose scale, cherry scale, and scurfy scale over a period of years are reported, the details being presented in nine tables and four graphs. The factors found to favor effectiveness of sprays were quiet atmospheric conditions, low humidity, and mild to warm weather at the time of making the applications. Efficient agitation in the spray tank was essential for all home-made and tank-mix emulsions.

"A paraffin-base oil having a viscosity of 81–84 sec. Saybolt and a higher evaporation rate than heavier oils was usually the least effective of the oils

used against San Jose and cherry scales. In home-made or tank-mix emulsions some of the medium-heavy and heavy petroleum oils (150–155 sec. and 220–255 sec. viscosity, respectively) gave inferior control to medium oils within the viscosity range of 105 to 120 sec. Saybolt. The heavier oils were more difficult to emulsify and separated more readily when diluted in the spray tank. Dormant sprays containing 3 percent of petroleum oil plus 2.5 percent of tar oil were effective in controlling rosy apple aphids and San Jose, cherry, and scurfy scales. Dormant sprays applied in March, containing approximately 2 to 2.2 percent of oil and dinitro-o-cyclohexylphenol dissolved in the oil or mixed with the emulsifier and used at the rate of about 7.5 to 11.5 oz. per 100 gal. of diluted spray, were effective in controlling rosy apple aphids, San Jose scale, and cherry scale, but against severe infestations of scurfy scale it was necessary to increase the oil content to 4 percent to obtain control. Dinitro-o-cyclohexylphenol used alone at the rate of 7.5 to 8 oz. per 100 gal. was less effective against the rosy apple aphids (84- to 86-percent control) than sprays in which it was used with oil. Mixtures of lauryl rhodanate (lorol thiocyanate) and petroleum oil were effective in controlling rosy apple aphids and scale insects, but at 0.2 to 0.8 percent of strength lauryl rhodanate was very caustic to fruit buds. Dinitro-o-cresol (2.5 lb. per 100 gal.) used as sodium dinitro-o-cresylate in a 3.6 percent dormant oil spray was effective in controlling the rosy apple aphids in 1930.

"The most effective delayed dormant spray against the rosy apple aphids consisted of 3 percent of oil plus 0.4 percent of tar oil. Other delayed dormant sprays listed in order of effectiveness were as follows: Lime-sulfur 2 gal. and nicotine sulfate 1 pt. per 100 gal., oil 3 percent and nicotine sulfate 1 pt. per 100 gal., oil 3 percent and cresylic acid 0.5 percent, and 3 percent of petroleum oil alone.

"That winter-strength lime-sulfur was effective against San Jose scale and cherry scale was evident from data based on examination of the number of live scales which survived through the summer following applications made in the spring or winter. Lime-sulfur was not effective against scurfy scale. Lime-sulfur (2 gal. per 100 gal.) added to an oil spray did not consistently increase its effectiveness against cherry scale, although a slight increase in effectiveness against San Jose scale was recorded. Petroleum oil at 4 percent strength gave an average control of 87 percent against scurfy scale, the range being 63 to 100 percent. Maximum control was obtained in late March when favorable weather conditions prevailed at the time of spraying. Petroleum oil at 4 percent strength and a wettable form of dinitro-o-cyclohexylphenol (8–9.8 oz. per 100 gal.) gave 99 to 100 percent of control of scurfy scale in three tests made in late March. Wood creosote at 6.1 percent strength gave only 63 percent of control of San Jose scale in 1934. Tar oil, 1.6 to 2.2 percent, plus paraffin wax, 0.6 to 0.8 percent, gave only 57 to 68 percent of control of scurfy scale as compared to 89 and 100 percent of control from 3 percent petroleum oil spray plus 2.5 percent of tar oil applied at the same time."

Experiments for the control of the chaff scale, A. Rotman (*Hadar, 12* (*1939*), *No. 5, p. 149*).—A brief report is made of the results of spraying and fumigation experiments conducted at Hedera on an 11- or 12-year-old Shamouti orange grove heavily infested with chaff scale. Fumigation with hydrocyanic acid gas was more effective than spraying with white oil emulsions of 1.75 and 1.5 percent strengths.

Factors influencing development and control of scale insects on citrus, W. L. Thompson. (Fla. Expt. Sta.). (*Citrus Indus., 20* (*1939*), *No. 7, pp. 4, 5, 9, 13, 16, 17*).

The European corn borer on the Eastern Shore of Virginia, D. W. Jones, H. G. Walker, and L. D. Anderson. (Coop. U. S. D. A.). (*Virginia Truck Sta. Bul. 102 (1939), pp. 1619–1648, figs. 4*).—Report is made of the joint results of work conducted from 1935 to 1938 on the Eastern Shore of Virginia, where the European corn borer first appeared in 1931. This pest, now found in small numbers in 10 Virginia counties that border on the Chesapeake Bay or the Potomac River in addition to Accomac and Northampton Counties on the Eastern Shore, had multiplied so rapidly that in 1935 it caused marked damage in a few cornfields. The abundance of borers on the Eastern Shore declined sharply in May 1936, then reached a maximum in 1937, and again decreased significantly in 1938, so that in January 1939 there was about the same level in numbers as in February 1936. There are three generations on the Eastern Shore of Virginia every 12 mo., the first generation infesting principally the stems of potato plants. A large majority of the second- and third-generation borers develop in corn. The feeding of the European corn borer is injurious to potatoes and probably causes a reduction in yield, the amount of damage caused by a given borer population probably varying from year to year, depending upon general growing conditions. From an agronomic standpoint corn planted between May 15 and June 10 over a 4-yr. period consistently produced higher yields than earlier or later planted corn. From corn varieties studied under existing corn borer abundance at Onley it would seem that certain of the new hybrid strains of corn will produce higher yields than the local varieties generally planted in this area.

"The principal factors affecting abundance are weather, farm practices, and predators and parasites. The winter and early spring mortality of borers due to weather is negligible. Drought and hot drying winds caused heavy mortality in the egg and small larval stages. Favorable weather for all three generations in 1937 resulted in a remarkably rapid increase in numbers of the European corn borer. Farm practices may affect borer abundance. Topping the stalks removes some borers from the field, but low cutting of the stalks and feeding them whole in pounds eliminates most of the borers, provided the stalks in the outer edges of the pounds are turned toward the center at least once to insure their being trampled in the wet manure by the livestock. Hand clean-up of debris left on the surface of cut cornfields helps to reduce infestation. Disking and plowing either high stubble or topped stalks leaves too many borers in the field to be effective as a control measure. Weeds are of little consequence as host plants at present. . . . Predators and parasites attacking European corn borer eggs are of some value late in the season. Six species of imported parasites have been liberated on the Eastern Shore to help in controlling the European corn borer. At least one of these species has become established."

Seasonal abundance of the corn earworm, F. F. Dicke. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 59 (1939), No. 4, pp. 237–257, figs. 5*).—Report is made of a study, commenced in 1932, of the general seasonal abundance of the corn earworm on corn in central Virginia and in the area in Virginia and Maryland adjacent to the District of Columbia, and also of the climatic factors that influence the seasonal abundance from year to year. The study was made not only in experimental plantings but also by surveys of populations in cornfields. Corn silking early in July and that silking after the middle of August received the highest rate of egg deposition and the highest percentage of ear infestation, the maximum occurring in the late-silking corn. The minimum percentage of ear infestation occurred in corn silking the latter part of July and the first part of August, when the acreage of corn attractive for oviposition

was at its maximum. When the seasonal larval population is adjusted according to the acreage of corn in silk attractive for oviposition, it is found that there is a rather rapid increase in population during this period of seemingly reduced abundance. The data indicate that the larval population reaches its maximum in the area under observation during the latter part of August. The heavy infestations in early-silking and late-silking corn are the result of concentrated oviposition on a comparatively small portion of the total corn acreage. The heavy infestations in late-maturing corn are of major importance in providing overwintering pupae. Higher infestations prevailed in small contiguous seasonal plantings than in the field. Because of the variation in the acreage of corn attractive to the moths for oviposition during the season the percentage of ears infested at any particular time is not regarded as a satisfactory index of the general abundance of the insect.

"In the area studied, when winter temperatures and precipitation are normal there is sufficient survival to cause material damage to the corn crop in the subsequent season. When the mean winter temperature falls to 30° F. or below a reduction in the abundance of the corn earworm in the field may be expected."

Restriction of the genus Gelechia (Lepidoptera: Gelechiidae), with descriptions of new genera, A. BUSCK (*U. S. Natl. Mus. Proc., 86 (1939), No. 3064, pp. 563–593, pls. 14*).—In this contribution 14 genera, of which 7 are new, are defined, with their type species, and 7 other genera are figured for comparison. Keys to the genera, based on male and female genitalia, and an alphabetical list of the species treated, with their generic assignments, are included.

Domestic mosquitoes, F. C. BISHOPP (*U. S. Dept. Agr. Leaflet 186 (1939), pp. 8, figs. 6*).—A practical account of the life history, habits, and control of three species of mosquitoes which breed in and about and infest the house, namely, the northern house mosquito, the southern house mosquito, and the yellow-fever mosquito. The northern house mosquito is widely distributed in the northern half of the country and in Canada, while the other two are commonly met with in the South.

Origin of mosquito-producing waters in the vicinity of Salt Lake City, Utah (Diptera Culicidae), D. M. REES (*Utah Univ. Bul., 29 (1939), No. 5, pp. 14, fig. 1*).

New Syrphidae (Diptera) from Central and North America, C. L. FLUKE. (Univ. Wis.). (*Ann. Ent. Soc. Amer., 32 (1939), No. 2, pp. 365–375, figs. 14*).—The genus *Tapetomyia* is erected, and nine species, representing nine genera, are described as new.

New or little-known species of West Indian Tipulidae (Diptera), IV, C. P. ALEXANDER. (Mass. State Col.). (*Jour. Agr. Univ. Puerto Rico [Col. Sta.], 23 (1939), No. 2, pp. 91–130, pls. 2*).—In continuation of this series (E. S. R., 78, p. 815) studies of extensive collections of crane flies taken on various West Indian Islands, and particularly on the higher mountains of Haiti and the Dominican Republic, are reported upon, descriptions being given of 22 new species and 5 new subspecies.

New and little known western Pipunculidae (Diptera), D. E. HARDY and G. F. KNOWLTON. (Utah Expt. Sta. and U. S. D. A.). (*Ann. Ent. Soc. Amer., 32 (1939), No. 1, pp. 113–124, figs. 33*).—Four species and five varieties of flies of the genus *Pipunculus*, several of which were collected or reared in connection with the beet leafhopper investigations, are described as new.

New Dolichopodidae (Diptera), F. C. HARMSTON and G. F. KNOWLTON. (Utah Expt. Sta.). (*Ann. Ent. Soc. Amer., 32 (1939), No. 2, pp. 349–352, figs. 10*).—Three species of Dolichopodidae, *Dolichopus refulgens* and *D. stricklandi* from Canada and *Asyndetus severini* from South Dakota, are described as new.

A key for blowfly larvae concerned in wound and cutaneous myiasis, E. F. KNIPLING. (U. S. D. A.). (*Ann. Ent. Soc. Amer., 32 (1939), No. 2, pp. 376–383, figs. 20*).—Keys to the second and third instar blowfly larvae are presented.

A new genus of Trypetidae near Anastrepha (Diptera), A. STONE. (U. S. D. A.). (*Jour. Wash. Acad. Sci., 29 (1939), No. 8, pp. 340–350, figs. 16*).—A study of species heretofore placed in the genus *Anastrepha* led to the erection of the new genus *Lucumaphila* for 11 forms, 3 being described as new to science.

The embryology of fleas, E. L. KESSEL (*Smithsn. Misc. Collect., 98 (1939), No. 3, pp. [2]+78, pls. 12*).

Control of shade tree borers, F. A. FENTON (*Oklahoma Sta. Cir. 84 (1939), pp. 28, figs. 20*).—Following general recommendations for borer control an account is given of 15 of the common and injurious species of insect borers that attack shade trees in Oklahoma.

The Mexican bean beetle in South Carolina, F. SHERMAN and J. N. TODD (*South Carolina Sta. Bul. 322 (1939), pp. 24, figs. 10*).—Observations of the seasonal activity, hibernation, food preference, and natural enemies and the results of experiments with insecticides in the control of the Mexican bean beetle, which first made its appearance in the State in 1921, are reported in tables and graphs. Observations have shown that emergence from hibernation is greatest following periods of rainfall and high temperatures. Snap beans, cowpeas, lima beans, and soybeans are the preferred hosts. Several predators were found to be rather abundant in the bean fields. Rotenone and associated compounds have given the best control. Magnesium arsenate and cryolite, either synthetic or natural, may be used in its control, but they leave a harmful residue and should not be applied after the pods form.

Eleven new American Coleoptera (Scarabaeidae, Cicindelidae), O. L. CARTWRIGHT. (S. C. Expt. Sta.). (*Ann. Ent. Soc. Amer., 32 (1939), No. 2, pp. 353–364, fig. 1*).—Eleven forms of Coleoptera, of which five represent the genus *Aphodius* and one each the genera *Phyllophaga, Ataenius, Diplotaxis, Polyphylla, Chlorixanthe,* and *Cicindela,* are described as new.

White grubs in lawns and golf courses, C. C. HAMILTON (*New Jersey Stas. Cir. 394 (1939), pp. 4*).—A practical account.

The external anatomy of the larva of the Pacific coast wireworm, H. P. LANCHESTER (*U. S. Dept. Agr., Tech. Bul. 693 (1939), pp. 40, figs. 7*).—A detailed and illustrated description is given of the external anatomy of the larva of the Pacific coast wireworm, one of the most important species of economic wireworms occurring in the Pacific Northwest. The description is prepared as a basis for taxonomic work on associated and nearly related wireworms.

The Cicindelidae of Iowa (Coleoptera), D. E. ECKHOFF (*Iowa State Col. Jour. Sci., 13 (1939), No. 2, pp. 201–230, fig. 1*).—A report of studies of the genus *Cicindela* is given, with a four-page list of references to the literature cited.

Fighting the pecan weevil [(Curculio caryae (Horn))], T. L. BISSELL. (Ga. Expt. Sta. and U. S. D. A.). (*Southeast. Pecan Growers Assoc. Proc., 33 (1939), pp. 36, 38–41, figs. 2*).

The production and marketing of honey in Maryland, R. F. BURDETTE and S. H. DEVAULT (*Maryland Sta. Bul. 427 (1939), pp. 30, figs. 7*).—This report of an economic study of honey production and marketing considers the extent and importance of the industry in the State, the factors affecting production, colony increases and losses, investment, income, expenses, profits, marketing, and diseases.

New species of bees of the genus Dufourea from California (Hymenoptera, Apoidea), P. H. TIMBERLAKE. (Calif. Citrus Expt. Sta.). (*Ann. Ent. Soc. Amer., 32 (1939), No. 2, pp. 395–414*).—Thirteen species of bees of the genus *Dufourea* from California are described as new.

The North American bees of the genus Osmia (Hymenoptera: Apoidea), G. A. SANDHOUSE (*Mem. Ent. Soc. Wash., No. 1 (1939), pp. [4]+167, figs. 278*).—In this synopsis of bees of the genus *Osmia*, 114 forms, representing 6 subgenera, are recognized, of which 19 species are described as new.

A contribution to the biology of North American vespine wasps, C. D. DUNCAN (*Stanford Univ. Pubs., Univ. Ser., Biol. Sci., 8 (1939), No. 1, pp. 272, figs. 255*).—This contribution embodies observations on the North American paper making wasps of the subfamily Vespinae, which includes hornets and yellow jackets. Following a brief introduction the sections deal with the morphology of *Vespula pensylvanica* (Sauss.) (pp. 13-84), systematic considerations (pp. 85-97), and biology of the Vespinae, including seasonal history of a wasp colony, hibernation, foods and feeding behavior, building activities, and life history and metamorphosis (pp. 98-176). A bibliography (pp. 177-184) and an index (pp. 257-272) are included.

Biological notes on the egg parasites of Malacosoma disstria Hbn., A. C. HODSON. (Minn. Expt. Sta.) (*Ann. Ent. Soc. Amer., 32 (1939), No. 1, pp. 131-136*).—In the course of observations made on the egg parasitism of the forest tent caterpillar as part of a comprehensive ecological study of this pest, five species of Hymenoptera were reared from egg masses collected in several localities in northern Minnesota, namely, *Ablerus clisiocampae* Ashm., *Trichogramma evanescens* Westw., *Oöencyrtus clisiocampae* Ashm., *Tetrastichus silvaticus* Gahan, and *Telenomus clisiocampae* Ashm. Each of the first two was found in but one sample of eggs; the remaining three were present in nearly all of the collections of eggs studied. The three most common egg parasites of the forest tent caterpillar were found to be well adapted to the life cycle of this host and widely distributed in the infested area. It is concluded that the low rate of egg parasitism is due more to factors associated with oviposition and egg mass construction than to other suggested possible influences.

A note on Stenobracon deesae (Cam.), a new parasite of the root-borer of sugarcane, E. S. NARAYANAN (*Indian Jour. Agr. Sci., 8 (1938), No. 2, pp. 215, 216, pl. 1*).—The percentage of parasitism of *Emmalocera depressella* Swinh. by *S. deesae* observed in the field in 1935 and 1936 varied from 3 to 5.

Biological studies on some hymenopterous parasites of aphidophagous Syrphidae, M. KAMAL (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 207 [1939], pp. [2]+111, figs. 101*).—Studies conducted in large part in the laboratories of the California Citrus Experiment Station but completed at Giza, Egypt, are reported. The parasites of syrphids dealt with are *Syrphoctonus maculifrons* (Cr.), *S. pacificus* Cr., *Homotropus decoratus* Cr., *H. humeralis* Prov., *Diplazon laetatorius* F., *D. orbitalis* Cr., *Bothriothorax californicus* How., *B. nigripes* How., *B. faridi* Kamal, *Syrphophagus smithi* Kamal, *Pachyneuron allograptae* Ash., *Conostigmus zaglouli* Kamal, and *C. timberlakei* Kamal. Following the accounts of these species, tables are given showing the sequence of the primary parasites and the seasonal occurrence of the parasites and their hosts, followed by general discussions of the habits of the parasitic larvae and a bibliography of six pages.

Introduction and colonization of two parasites of the pineapple mealybug in Puerto Rico, K. A. BARTLETT. (P. R. Expt. Sta.). (*Jour. Agr. Univ. Puerto Rico [Col. Sta.], 23 (1939), No. 2, pp. 67-72*).—The work of introduction, rearing, colonization, and recovery of parasites of the pineapple mealybug, the most serious pest of pineapple in Puerto Rico, where it is distributed over the island, is reported. The parasite *Anagyrus coccidivorus* Doz. was first introduced from Brazil in 1936, and *Hambletonia pseudococcina* Comp. was introduced from Brazil and Venezuela by way of Hawaii in 1937. Both of these parasites were successfully reared in the laboratory and liberated in Puerto Rico. *H. pseudo-*

coccina was first recovered in May 1937 and by January 1939 was present in all the fields examined in four separate localities about Lajas, parasitized mealybugs being readily collected in large numbers throughout the area. Thus far *A. coccidivorus* has not been recovered.

Environmental control of sex in hymenopterous insects, S. E. FLANDERS. (Calif. Citrus Expt. Sta.). (*Ann. Ent. Soc. Amer., 32 (1939), No. 1, pp. 11–26, figs. 7*).

Monograph of a new neotropical mutillid genus, Pappognatha (Hymenoptera: Mutillidae), C. E. MICKEL. (Minn. Expt. Sta.). (*Ann. Ent. Soc. Amer., 32 (1939), No. 2, pp. 329–343*).

The occurrence of spinose ear tick (Ornithodoros megnini Dugès) in India, S. K. SEN (*Indian Jour. Vet. Sci. and Anim. Husb., 7 (1937), No. 3, pp. 213–218, pls. 2*).—A report is made on the ear tick, the occurrence of which in India was first recorded by Kingston in 1936 (E. S. R., 76, p. 667).

ANIMAL PRODUCTION

Animal breeding, L. M. WINTERS (*New York: John Wiley & Sons; London: Chapman & Hall, 1939, 3. ed., pp. VIII+316, pl. 1, figs. 118*).—In this revised and enlarged edition of this well-known textbook (E. S. R., 63, p. 758), the objectives have changed markedly from those of the earlier editions, the chief objective now being to present the more modern philosophy of animal breeding.

[Investigations with livestock in Arizona] (*Arizona Sta. Rpt. 1938, pp. 32–35, 71, 74, 75*).—Studies for which results are briefly reported include the *nutritive qualities of a grassland range and the value of supplemental feeding of* cattle on winter range, range areas resulting in mineral and vitamin A deficiency in cattle, the relation between conformation of feeder steers and their feeding and slaughter efficiency, the effect of backcrosses and reciprocal crosses in chickens on egg production in the offspring, and the rate and efficiency of egg production of birds entered in the State egg-laying contest.

[Investigations with livestock in New Hampshire], E. G. RITZMAN, A. E. TEPPER, C. A. BOTTORFF, R. C. DURGIN, T. B. CHARLES, P. A. WILCOX, W. T. ACKERMAN, and G. M. FOULKROD (*New Hampshire Sta. Bul. 313 (1939), pp. 15, 16, 29–31*).—Progress reports (E. S. R., 79, p. 521) are presented for the following investigations: The effect of age, season of the year, and certain other factors on the metabolism of cattle, swine, and horses; breeding sheep for improved milk production and fecundity; the influence of the fineness of grit in poultry rations; factors affecting the efficiency of brooders, including tests with gas-burning brooders; the protein requirements of chickens; and laying cages v. floor pens.

Mineral composition of soils and forage crops in eastern Canada.—I, Timothy hay and oat straw, L. E. WRIGHT, J. C. WOODWARD, and C. H. ROBINSON (*Sci. Agr., 19 (1939), No. 11, pp. 673–686*).—Continuing this line of investigation (E. S. R., 78, p. 675), no relation was established between the calcium and phosphorus content of timothy hay or oat straw and the exchangeable calcium and soluble phosphorus of the soil on which they were produced. Reported instances of mineral deficiencies in livestock were not related to the calcium and phosphorus content of the hay or straw.

Pasture studies, XIV, XV (*Sci. Agr., 19 (1939), Nos. 6, pp. 345–357, fig. 1; 12, pp. 701–711, figs. 3*).—Two phases of this investigation (E. S. R., 79, p. 19) are reported.

XIV. *The nutritive value of pasture herbage—some problems in its estimation and some results thus far obtained at Macdonald College,* E. W. Crampton.—

The problem is reviewed in considerable detail. In the author's opinion, many of the criteria heretofore used to measure the nutritive value of pasture herbage are not only imperfect but may be misleading indexes for this purpose. Animal feeding tests are considered the only method advanced to date by which the feeding value of pasture herbage can be estimated with certainty. The use of rabbits as pilot animals for sheep and steers has given results sufficiently promising to justify further experiments along this line.

XV. *The intra-seasonal changes in the nutritive value of pasture herbage*, E. W. Crampton and R. P. Forshaw.—Herbage clippings obtained from an unfertilized sod of Kentucky bluegrass, redtop, and wild white clover at approximately 10-day intervals from May to September were dried and fed to rabbits as test animals in this experiment. A progressive decline in nutritive value during the summer months and a return to that of spring grass with better growing conditions in the fall was established. Similarly, dry matter, nitrogen, cellulose, and nitrogen-free extract gradually decreased in digestibility as the season advanced, followed by a complete recovery in the fall. The lignin content was the only constituent showing a seasonal trend which might explain these seasonal changes in digestibility. It appeared that not only the amount but also the mode of deposition of lignin determines the extent of its effect upon the digestibility and nutritive value of pasture herbage.

Commercial feeding stuffs, 1938–39, E. R. Tobey (*Maine Sta. Off. Insp. 172 (1939), pp. 46*).—This is the usual report of the guarantees and analyses for protein, fat, and fiber of 793 samples of feeding stuffs collected for official inspection during the year ended June 30, 1939 (E. S. R., 80, p. 524).

Feed analysis, W. L. Adams, T. Wright, Jr., and L. Linton (*Rhode Island Sta. Ann. Feed and Fert. Cir., 1938, pp. 4–61*).—The guaranteed and found analyses of 464 samples of stock, dairy, and poultry feeds and 165 samples of dog, cat, and pet feeds, collected for inspection, are presented.

Dynamic effects and net energy values of protein, carbohydrate, and fat, E. B. Forbes, J. W. Bratzler, E. J. Thacker, and L. F. Marcy. (Pa. Expt. Sta.). (*Jour. Nutr., 18 (1939), No. 1, pp. 57–70*).—Following the same general plan of experimentation as previously described (E. S. R., 74, p. 80), the dynamic effects and net energy values of beef muscle, dextrin, and lard were determined for each separately and in combination. Each ration was fed to a group or five rats averaging approximately 100 gm. in weight and to another group averaging about 240 gm. in weight. Among the individual supplements the dynamic effect of beef muscle protein was highest, that of dextrin intermediate, and that of lard lowest. The dynamic effect of the mixture of all three was even lower than that of lard alone, indicating that the effects of individual nutrients are not significant with reference to combined nutrients. In nearly all cases the dynamic effects of the different types were higher for the lighter weight group of rats. The net energy of the beef muscle was lowest, that of dextrin higher, and that of lard much higher still, while the mixture ranked between dextrin and lard in this respect.

The utilization of energy producing nutriment and protein as affected by the level of the intake of beef muscle protein, E. B. Forbes, A. Black, E. J. Thacker, and R. W. Swift. (Pa. Expt. Sta.). (*Jour. Nutr., 18 (1939), No. 1, pp. 47–56, figs. 4*).—Employing the same technic as in earlier experiments (E. S. R., 80, p. 380), two groups of 24 rats each were fed diets in which beef muscle was the principal food protein. Four equicaloric diets containing 10, 25, 35, and 45 percent protein, respectively, were used, each rat of the quarduplet receiving a different level of protein. One group was limited in food consumption to approximately the amount consumed in earlier experiments with casein as the

source of protein, while the second group was allowed to eat 44.7 percent more. The metabolizability of the diets diminished at a nearly regular rate from the lowest to the highest protein level. The heat production diminished slightly from the 10- to the 45-percent level, the rates being less and greater than the accompanying decreases in metabolizable energy on the low and high planes of food intake, respectively. The body gains diminished materially on the low plane, but increased slightly on the high plane as the protein level increased. Distribution of food nitrogen and composition of the body increase as affected by the composition of the diet is indicated. Beef muscle did not exert a greater heat-stimulating effect than casein on the growing rats.

Growth rate, reproduction, and histological changes in rats fed rations used in nutritional studies of swine, W. E. Reeder, V. E. Nelson, H. E. Biester, and D. F. Eveleth. (Iowa State Col.). (*North Amer. Vet., 20 (1939), No. 8, pp. 28–34, figs. 6*).—Six types of basal diets were compared in these studies, including a mixture of yellow corn and minerals supplemented with 0, 2, 15, and 40 percent of skim milk powder, and a mixture of polished rice, minerals, and cod-liver oil supplemented with 20 percent of either skim milk powder or tankage. Sublots on each of the corn rations received 1 percent of Mazola oil and 1 percent of cod-liver oil, respectively. Growth rate, ability to rear young, and pathological changes observed in the myelin sheath of medullated nerve fibers, kidneys, ovaries, testicles, and bone were all definitely correlated with composition of the ration. The higher levels of protein feeding delayed but did not prevent the development of myelin sheath degeneration. The yellow corn ration with little or no skim milk powder resulted in reproductive failure and physiologic disturbances, while corn plus 15 or 40 percent of skim milk powder prevented degeneration of testicular tissue and supported normal reproduction, suggesting that some factor other than vitamin E was involved. The negative control groups receiving the polished rice rations containing little or no vitamin E presented severe testicular changes typical of vitamin E deficiency. The high-protein rations also resulted in the development of stronger bones. The information gained by using rats in such studies, while not entirely applicable to swine nutrition, is considered an excellent preliminary procedure for the more costly and time-consuming studies in which swine were used.

Riboflavin (*Rahway, N. J.: Merck & Co., 1939, pp. [1]+77*).—An annotated bibliography, including 483 references.

Failure to produce abdominal neoplasms in rats receiving wheat germ oil extracted in various ways, H. M. Evans and G. A. Emerson. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc., 41 (1939), No. 2, pp. 318–320*).—In a series of trials ranging from 45 to 370 days' duration and involving 101 individuals, rats of the Long-Evans strain did not develop abdominal neoplasms when fed relatively high levels of either ether-extracted or cold-pressed wheat germ oil. These findings failed to confirm those of Rowntree et al., who used Wistar, Buffalo, and Yale albino strains of rats.

Effect of wheat germ oil upon E-deficient muscular dystrophy, G. C. Knowlton, H. M. Hines, and K. M. Brinkhous (*Soc. Expt. Biol. and Med. Proc., 41 (1939), No. 2, pp. 453–456*).—Rats maintained on vitamin E-deficient diets from birth developed acute muscular dystrophy with histological evidence of muscle necrosis and muscle regeneration and chemical evidence of increased chloride and water concentration in the muscles at 5 mo. of age. Subsequent additions of wheat germ oil for 2 or 3 mo. resulted in complete recovery with respect to the chloride and water concentration and evidence of necrosis. However, the muscles in recovered animals lacked the ability to develop the normal amount of tension as measured quantitatively.

Degrees of sterility in the female rat held on E-free rations, H. M. EVANS and G. A. EMERSON (*Science, 89 (1939), No. 2315, pp. 438, 439*).—The vitamin E requirement of female rats for normal gestation is reported to increase markedly with advancing age. After 8 mo. of age the minimum curative dose is double or triple that required in young mature females and after 1 yr. 8 to 10 times as much. In still older females no practicable dose level of vitamin E will permit the birth of normal young, although these females conceive and implant. The cause of this phenomenon remains obscure.

Reduced muscle creatine in paralyzed young E-low rats, I. R. TELFORD, G. A. EMERSON, and H. M. EVANS. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc., 41 (1939), No. 2, pp. 315–318*).—In further studies (E. S. R., 82, p. 88), paralysis was produced in young rats by allowing them to suckle mothers maintained on a vitimin E-deficient diet. Fresh muscle tissue from the paralyzed rats and from normal litter mates which had suckled foster mothers receiving vitamin E were analyzed for creatine. At 21 days of age muscles from the paralyzed and control rats contained average creatine values of 152 and 242 mg. per 100 gm. of tissue, respectively. In cases where spontaneous recovery from paralysis occurred, normal muscle creatine values were noted. It is shown that the lowered muscle creatine in paralyzed animals was not produced by inanition.

The heat production of the fasting rat in relation to the environmental temperature, R. W. SWIFT and R. M. FORBES. (Pa. Expt. Sta.). (*Jour. Nutr., 18 (1939), No. 3, pp. 307–318, figs. 2*).—In a series of tests using the open-circuit Haldane method of procedure the heat production of albino rats in the postabsorptive state was determined over 8-hr. periods of measurement at environmental temperatures ranging from 7.5° to 35° C. The critical temperature was found to be 30°. The respiratory quotient constantly increased and the heat production per hour steadily declined as the temperature increased from 7.5° to 30°, while metabolism was constant over the range of 30° to 33°. The percentage of total heat eliminated as latent heat of water vapor increased steadily from 7.9 to 59.2 percent as temperature increased over the experimental range. However, the absolute amount of heat eliminated in this manner was practically constant up to 31°, above which a definite increase was noted.

The distribution of the chick antidermatitis factor (pantothenic acid) in meats and meat products, H. A. WAISMAN, O. MICKELSEN, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Jour. Nutr., 18 (1939), No. 3, pp. 247–256*).—Based on the minimum protective level of feeding which gave complete protection against chick dermatitis, the potency of pantothenic acid in various tissues of cattle, hogs, and lambs is indicated. The liver and kidneys of the various species were found to be the richest sources of this factor, followed by the heart, spleen, brain, pancreas, tongue, and lungs. Muscular tissues of beef, lamb, pork, and veal were relatively low in potency. Ordinary stewing reduced the potency of kidney, heart, and spleen tissues by approximately one-third. However, frying appeared to increase rather than decrease the potency in beef liver.

Colour of meat, I, II, C. A. WINKLER (*Canad. Jour. Res., 17 (1939), Nos. 1, Sect. D, pp. 1–7, figs. 4; 2, Sect. D, pp. 29–34, figs. 3*).—These studies were carried on at the National Research Laboratories, Ottawa.

I. *Apparatus for its measurement, and relation between pH and colour.*—A photoelectric color comparator, used in the course of these meat color studies, is described and illustrated. Using this apparatus, the relation between pH and color was found to be similar in pork, beef, and mutton, both in untreated samples and those in which pH was adjusted by injections of lactic acid or ammonia. A maximum scatter of red, green, and blue was found to occur at a

pH range of 5.0 to 5.5. Samples appeared gray in color at pH levels acid to the region of maximum scatter, pink in the region of maximum scatter, and darker red at increasing pH levels. Changes in the quality of color were accompanied by changes in the ratio of red to green and red to blue.

II. *Effect of desiccation on the colour of cured pork.*—It was found that in the absence of air a linear relation occurred between moisture loss and color change. This change was independent of temperature and was reversible. In air no definite relation was found between changes in humidity and color quality, changes in both intensity and quality of color occurring regardless of the degree of humidity. Changes in color intensity became complete more rapidly in saturated air than in air at lower humidity. Temperature had no influence on the rate of color change either in dry air or in air at 60 percent relative humidity.

Tenderness of meat.—I, A recording apparatus for its estimation, and relation between pH and tenderness, C. A. WINKLER (*Canad. Jour. Res., 17 (1939), No. 1, Sect. D, pp. 8–14, figs. 3*).—A recording apparatus for estimating the tenderness of meat is described. In operation, samples of meat are cut between blunt jaws brought together by a constantly increasing force. The standard deviation of the mean of duplicate determinations on a single sample was ±3 percent. Samples of pork and beef, adjusted to a given pH by injections of lactic acid or ammonia, were tested. Toughness of pork was at a maximum at a pH of 5.0–6.0, while at increasing or decreasing levels the meat became progressively more tender. Similar results were obtained with beef, although the results were more variable and maximum toughness appeared to occur at a slightly lower pH than for pork.

Nutritional physiology of the adult ruminant, E. B. FORBES. (Pa. State Col.). (*Science, 90 (1939), No. 2334, pp. 270–272*).—A critical review of the publication previously noted (E. S. R., 80, p. 670).

Cooperative researches on the nutritional physiology of the adult ruminant, E. G. RITZMAN. (Univ. N. H.). (*Carnegie Inst. Wash. Yearbook, 37 (1937–38), pp. 329–331*).—A brief statement of the objectives and progress of the cooperative researches carried on in this field.

Native cows, registered beef bulls, good pastures prove profitable when used in calf production, feeding tests, H. H. LEVECK (*Miss. Farm Res. [Mississippi Sta.], 2 (1939), No. 9, p. 8*).—The results are presented for a single feeding trial comparing the rate and efficiency of gains and carcass quality of five groups of calves, all from unimproved native cows but sired by native, Polled Devon, Polled Hereford, Polled Shorthorn, and Aberdeen Angus bulls, respectively. At weaning age all crossbreds graded as Good feeder calves, while the natives graded Medium, with an estimated spread of $1.50 per hundredweight in market value between the two grades. The Devon crossbreds exceeded all other groups in average daily gain during the fattening period with 1.88 lb., while all crossbreds averaged 1.73 lb., and the natives 1.55 lb. gain per head daily. The average grade of the crossbred carcasses was Good and that of the natives Medium. The crossbreds averaged higher returns above feed and calf costs despite the higher valuation of the crossbred feeder calves.

Greater profits for all concerned may be realized by growing well-bred cattle, H. B. OSLAND (*Colo. Farm Bul. [Colorado Sta.], 1 (1939), No. 4, pp. 7, 8*).—A brief discussion of the economic desirability of producing well-bred cattle capable of superior performance on the range and in the feed lot. The need for better quality range bulls is stressed.

Cottonseed meal for fattening yearling steers, J. H. KNOX and P. E. NEALE (*New Mexico Sta. Bul. 262 (1939), pp. 15, figs. 5*).—In each of three feeding trials,

extending over 168 days, four lots of yearling steers received concentrate rations of (1) ground kafir plus a small amount of cottonseed meal, (2) a mixture of ground kafir and cottonseed meal 1 : 1, (3) cottonseed meal, and (4) cottonseed meal fed at a limited rate for the first half of the period and full-fed the latter half. Corn silage and alfalfa hay were fed to all lots. The average daily gains per steer were 2.18, 2.31, 2.34, and 2.09 lb., the average feed cost per 100 lb. of gain $10.13, $10.07, $9.83, and $9.68, and the average profit per head above initial cost plus feed and market costs were $13.55, $13.16, $14.88, and $14.66 for groups 1 to 4, respectively. Steers full-fed cottonseed meal throughout the period consumed an average of 9.51 lb. per head daily or 405.2 lb. per hundredweight of gain, and developed into choice fat animals with no evidence of nutritive deficiency symptoms under this feeding plan. Steers fed large amounts of silage the first half of the period with heavy feeding of cottonseed meal deferred until the latter part produced economical gains but not so much finish as the other rations. All the rations gave satisfactory returns, so that the choice of the one to use should be governed primarily by the comparative costs of kafir, cottonseed meal, and silage.

Soybean hay, alfalfa hay, and yellow corn as vitamin A supplements in cottonseed meal rations for growing cattle, J. O. Halverson, E. H. Hostetler, J. E. Foster, and F. W. Sherwood. (N. C. Expt. Sta.). (*Jour. Nutr.*, *18* (*1939*), *No. 3*, *pp. 285–296*).—In a series of experiments with young growing cattle, it was further shown that a ration composed largely of cottonseed meal and cottonseed hulls is very deficient in vitamin A precursors and invariably results in severe avitaminosis A. Adding yellow corn up to 26 percent of the total ration failed to supply an adequate amount of vitamin A. No. 3 alfalfa hay of relatively low carotene content when added to the basal ration at a 20-percent level was also inadequate. Soybean hay containing approximately twice as much carotene as the alfalfa hay when fed at a 20-percent level proved adequate for normal growth and physical well-being of young cattle, and in one instance a heifer receiving 30 percent of this hay passed through a successful gestation and lactation period. The minimum daily carotene requirement of cattle was estimated to be an amount equivalent to approximately 43 to 55 International Units of vitamin A per kilogram of body weight.

Carotene intake, level of blood plasma carotene, and the development of papillary edema and nyctalopia in calves, L. A. Moore. (*Mich. Expt. Sta.*). (*Jour. Dairy Sci.*, *22* (*1939*), *No. 10*, *pp. 803–812*, *figs. 2*).—Continuing this line of investigation (E. S. R., 81, p. 558), it was found that calves maintained on a low-carotene diet after from 40 to 90 days developed night blindness in from 48 to 73 days. Papillary edema developed at approximately the same time, with some variations. Blood carotene declined to relatively low levels on the low-carotene diet, and when these values fell below 0.13 μg. per cubic centimeter night blindness and papillary edema followed. An intake of 9 μg. of carotene per pound of body weight daily was not sufficient to prevent night blindness or an increase in papillary edema, while 16 μg. proved adequate to maintain the plasma carotene above 0.2 μg. per cubic centimeter and prevent these diseases. These results confirm findings of the California Experiment Station (E. S. R., 74, p. 527) on the minimum carotene requirements of cattle.

Studies with a deficient ration for sheep.—I, Effect of various supplements; II, Effect of a cobalt supplement, J. E. Bowstead and J. P. Sackville (*Canad. Jour. Res.*, *17* (*1939*), *No. 1*, *Sect. D*, *pp. 15–28*, *figs. 3*).—This contribution from the University of Alberta describes the value of various supplements in combating an unthrifty condition of sheep which developed when they were maintained on a basal diet of nonleguminous hay and ground oats. The addition of iron and copper to the diet proved detrimental, and wheat germ meal in

the ration failed to improve the condition. Additions of calcium and phosphorus, cod-liver oil, tankage, linseed meal, bran, or alfalfa meal or access to pasture, each tended to delay the appearance of the unthrifty condition but none entirely prevented it. Alfalfa ash proved superior to any of the above supplements, suggesting that the deficiency in the basal diet was one or more of the minerals contained in alfalfa.

Certain ewes which had developed the characteristic unthrifty condition on the various diets described above were given a cobalt supplement equivalent to 5 mg. of cobalt per head daily. There followed a rapid increase in weight and improvement in thrift. Analyses indicated that the nonleguminous hay produced in the area was very low in cobalt. These findings suggest that a cobalt problem may exist in western Canada.

Control of leafy spurge by sheep, E. A. Helgeson and E. J. Thompson (*North Dakota Sta. Bimo. Bul., 2 (1939), No. 1, pp. 5–9, figs. 3*).—Trials conducted in 1937 and 1938 gave evidence that sheep will graze leafy spurge when closely confined to it and will maintain growth comparable to that of sheep on a typical farm pasture. Such grazing resulted in a decrease in the amount of spurge and an increase in the amount of bluegrass in the plant population. No illness of sheep directly traceable to spurge was observed. Digestion trials with lambs showed spurge silage to be reasonably high in nutrient content (E. S. R., 81, p. 403). No toxic effect of the spurge silage on sheep was noted.

[Swine feeding experiments in Norway, I–V] (*Meld. Norges Landbr. Høgskole, 19 (1939), No. 4–5, pp. 271–306; Eng. abs., pp. 303–306*).—These studies were conducted at the Royal Agricultural College of Norway.

I. *Feeding experiments with grass meal for bacon pigs,* M. Husby.—Grass meal containing 12.3 percent of protein and 29.5 percent of crude fiber, when fed as a supplement to the concentrate ration of bacon pigs, had a good influence on the growth and thrift of the animals, although little effect on the efficiency of feed utilization was noted. However, the grass meal adversely affected the color of the carcass, resulting in a grayish-yellow color. The computed feeding value was 1 feed unit per 1.7–1.8 kg. of the meal.

II. *Feeding experiments with roots (swedes) for bacon pigs,* M. Husby.—The feeding of about 1.5 kg. of swedes per pig daily resulted in a reduced efficiency of feed utilization, a prolonged fattening period, and a soft and very thin back fat. It is recommended that not over 100–150 gm. of swedes per pig daily be fed.

III. *Dried casein as a protein supplement for bacon pigs,* M. Husby.—A comparison of skim milk and casein as protein supplements indicated very favorable results with the casein. It had a calculated feed value of 1 feed unit per 0.73 kg., or on the basis of feed units for fattening 1 unit per kilogram.

IV. *Feeding experiments with liver meal rich in salt for bacon pigs,* H. Hvidsten.—Fish liver meal containing 17.2 percent of salt was fed to pigs in amounts ranging up to 250 gm. per head daily without injurious effect to the pigs or deleterious effect on pork quality.

V. *Calcium lactate as a mineral supplement for bacon pigs,* H. D. Meberg.—A comparison of calcium lactate and calcium carbonate as mineral supplements for pigs showed no significant difference in feed consumption or rate of gain on the two rations, hence the use of the higher priced calcium lactate was not justified.

Growth and feed consumption of bacon hogs, E. W. Crampton (*Sci. Agr., 19 (1939), No. 12, pp. 736–744, figs. 5*).—Data taken on the experimental herd of Canadian Yorkshire pigs at Macdonald College are presented in both tabular and graphic form. The pigs were individually penned and fed indoors to the limit of appetite from weaning age to approximately 200 lb. live weight.

Nutritive requirements of young pigs, M. M. WINTROBE. (Coop. U. S. D. A.). (*Amer. Jour. Physiol.*, *126* (*1939*), *No. 2*, *pp. 375–387*, *figs. 5*).—A series of trials at Johns Hopkins University comparing the adequacy of various synthetic diets for pigs indicated that a diet of casein (24 percent), lard (13.5), and sucrose (62.5 percent), plus an adequate amount of a suitable mineral mixture (as described), and with vitamins supplied by 0.5 gm. of cod-liver oil and 3 gm. or more of yeast daily permitted good growth in pigs weaned at from 2 to 23 days of age. An amount of diet supplying about 157 calories per kilogram of body weight daily was considered satisfactory. When an inadequate amount of the mineral mixture was supplied the rate of growth was retarded and spontaneous fractures occurred. Reducing the quantity of yeast impaired the rate of growth. In such animals the daily injections of thiamin chloride accelerated growth. The need for riboflavin was not clearly demonstrated in these trials. The addition of nicotinic acid at the rate of 2 mg. per kilogram of weight daily markedly increased the growth rate. However, yeast apparently supplied some growth factor or factors not supplied by thiamin chloride, riboflavin, or nicotinic acid. These necessary growth factors appeared more readily available in yeast than in liver extract. The concentrate of milk vitamins was no more effective than yeast in promoting growth.

The prevention of anaemia in pigs reared indoors, A. S. FOOT and S. Y. THOMSON (*Jour. Min. Agr.* [*Gt. Brit.*], *45* (*1938*), *No. 5*, *pp. 452–459*, *fig. 1*).—Experiments were conducted at the National Institute for Research in Dairying to determine the effect of administration of iron to pregnant sows and of direct administration of iron and copper to young pigs on the hemoglobin concentration in the blood, survival, and growth rate of the pigs. Pigs from sows receiving from 12.5 to 70 gm. of iron during late pregnancy showed only slightly higher hemoglobin concentration than pigs from untreated sows. The administration of iron and copper to the pigs during the second or third week of life markedly increased the hemoglobin content of the blood and permitted more rapid growth, particularly when treated at the earlier age, as compared with untreated pigs. Iron pyrophosphate appeared to have certain advantages for this purpose over other iron salts or preparations.

Iron deficiency as the probable cause of stillbirth in swine, R. M. ARCHIBALD and E. E. I. HANCOCK (*Canad. Jour. Compar. Med.*, *3* (*1939*), *No. 5*, *p. 134*).—This report is based on a limited number of observations without definite controls so that the findings are regarded as suggestive rather than conclusive.

Improvement of carcass quality in pigs, C. P. MCMEEKAN and J. HAMMOND (*Jour. Min. Agr.* [*Gt. Brit.*], *46* (*1939*), *No. 3*, *pp. 238–243*, *pls. 4*, *fig. 1*).—To test the effect of varying rates of growth at different periods of development on the final carcass quality of bacon pigs, four groups of pigs were made to grow at different rates by regulating the level of feed intake. Two groups received a high level and two a low level to 16 weeks of age, after which one high and one low group were continued at a high plane and the other two at a low plane of nutrition. All were slaughtered at 200 lb. weight, the high-high group attaining this weight in 165 days, the high-low and the low-high groups in about 211 days, and the low-low group in about 327 days. The carcass composition of the various groups varied materially, with an average of 11, 11, 10, and 12 percent bone, 40, 45, 36, and 49 percent muscle, and 38, 33, 44, and 27 percent fat in the high-high, high-low, low-high, and low-low carcasses, respectively. These differences are strikingly illustrated by photographs of the whole carcasses and cuts through the last rib. For production of bacon pigs, rapid growth in early life followed by rationing which does not put on too much fat is considered most desirable.

Significance of variation in ham conformation, R. L. HINER and O. G. HANKINS. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *59* (*1939*), *No. 4*, *pp. 293–302*, *figs. 4*).—A total of 59 hams from Poland China hogs, varying in type but fed under uniform conditions to a weight of 225 lb., were used in this study. The index of plumpness of hams used to express ham conformation was based on the following formula:

$$\frac{\text{Circumference of ham at midpoint between aitchbone and hock} \times 100}{\text{Length from lowest point of aitchbone to center of inside of hock}}.$$

As plumpness increased, length of ham and length of leg decreased, while circumference of ham, thickness of ham fat, and thickness of back fat increased. Also the length of ham per unit of weight decreased. The weight of important muscles was not consistently affected by increase in plumpness, but the percentage of rectus femoris declined and that of semimembranosus increased in relation to the total muscle tissue with increasing plumpness, the correlation being highly significant in the case of the former. Percentages of fat and lean, thickness of ham fat and back fat, ratio of edible to inedible portion, and ratio of length of hind leg to width of carcass through hams were all significantly correlated with plumpness. Multiple correlations indicated that variation in ham conformation was due more to combinations of factors than to single factors, with percentage of fat the dominant characteristic of those studied.

[**Poultry investigations in New Jersey**] (*New Jersey Stas. Rpt. 1938*, *pp. 12, 13, 94–96, 97*).—Findings are briefly reported for the following lines of investigation: Changing trends in egg production performance and mortality at the State egg-laying contests; the significance of egg production performance records as a basis of poultry breeder selection; the development of a strain of White Leghorns especially suited to individual cage management; the economy and efficiency of various stud mating methods; crossbreeding for meat production and the economy of White Leghorn capon production; fat requirements and metabolism of the chicken; the modifying influence of environment on hatchability, growth, egg-laying characters, and egg weight; a comparison of the effect of slow, medium, and fast growth rates in White Leghorn pullets; management of laying and breeding stock in individual cages; the efficiency and economy of egg production by Khaki-Campbell ducks; and a study of grains suitable for squab production.

Open letter to beginners in poultry and egg farming, W. C. THOMPSON (*New Jersey Stas. Hints to Poultrymen, 26* (*1939*), *No. 3*, *pp. 4*).—Practical suggestions are offered regarding the production of table eggs, essentials for starting in the business, and buildings and management.

The management of hens in laying cages, W. C. THOMPSON (*New Jersey Stas. Bul. 668* (*1939*), *pp. 16*, *figs. 2*).—The results of over 4 years' practical experiments in the management of laying hens in individual cages are summarized, with particular reference to 10 points of inquiry considered in the study. Cage management of layers was found to compare favorably with floor management in maintaining the health of the birds and in inducing a maximum safe egg yield over a prolonged period of time as measured by six different criteria. Within the limits of this test there was no indication that cage management exerted any serious ill effect on the general health and production tendencies of individual hens. Neither was there any evidence of an undesirable effect of confinement on egg quality. Production costs of eggs under the cage system compare favorably with those under floor management. The cage system offers definite advantages in sanitation, particularly because the use of litter is eliminated. The labor requirement under this system is not necessarily greater though somewhat different and more routine in nature than that required in the average floor plant. The efficiency of the cage system in meeting the needs of breeding

plants has received relatively little attention in this study. The initial cost of equipment, plus costs of repairs, deterioration, and replacement are among the more serious disadvantages to the cage system. It is estimated that the equipment should have a life span of at least 10 yr. if properly handled and maintained.

A possible relation between manganese, sunlight, and winter hatchability of hen's eggs, J. B. CHRISTIANSEN, J. G. HALPIN, and E. B. HART. (Univ. Wis.). (*Science, 90 (1939), No. 2337, pp. 356, 357, fig 1*).—The hatchabilities of eggs from hens receiving a basal diet relatively low in manganese and from hens receiving the basal diet plus 85 p. p. m. of manganese were compared at bimonthly intervals over an extended period. During the late fall and winter months the hatchability of eggs produced on the basal and supplemented rations averaged 48.1 and 62 percent, respectively. However, in late spring and early summer there was only a very slight difference in hatchability in favor of the supplemented ration. Thus it appeared that the amount of sunshine exerted a marked effect on the manganese requirements for optimum hatchability. It was shown that vitamin D was not a complicating factor in this trial.

Factors affecting the post-natal growth of Brown Leghorn chickens, N. GALPIN (*Empire Jour. Expt. Agr., 7 (1939), No. 26, pp. 139–144, fig. 1*).—This study at the University of Edinburgh indicated that the season of the year and the individuality of the dam were important factors in determining the weight attained at 6 weeks of age by Brown Leghorn chickens. The age of the dams showed no significant effect in this respect. The weight at 6 weeks was highest in chickens from eggs laid early in the year, declining to a minimum in May and June and rising again in autumn. This seasonal effect on growth rate was most marked during the third and fourth weeks of life. It appeared to be due mainly to characters vested in the egg rather than to external influences acting during the development of the young chicken.

The cereals in the fattening ration, I, II (*Sci. Agr., 19 (1939), No. 9, pp. 597–607*).—Two reports are noted.

1. *The comparative effect upon gains and composition of the carcasses with mature roasters,* W. A. and A. J. G. Maw and R. Holcomb (pp. 597–601).—Groups of mature Rhode Island Red roasters were fattened for 21 days with the ground cereals, corn, wheat, oats, and barley, respectively. Each grain was supplemented with animal protein only. The wheat- and oat-fed groups gained more rapidly during the early days of the period. Over the entire period, however, the corn-fed group made the best gains, followed in order by the wheat-, barley-, and oat-fed groups. The corn-fed group showed the largest amount of total fat in the edible portion of the carcass, while the oat- and barley-fed groups were lowest in this respect. Considerable difference existed in the distribution of fat between the skin, flesh, and abdominal fat for the various groups.

II. *Their comparative values for fattening Leghorn broilers.* W. A. and A. J. G. Maw (pp. 602–607).—Corn, wheat, whole oats, hull-less oats, whole barley, and hull-less barley, each in ground form and supplemented with animal protein, were compared in 14-day fattening trials with White Leghorn broilers. The length of the feeding period affected the gains made on various rations. The corn, wheat, and barley rations were most efficient over the 14-day period. Corn produced the largest amount of fat in the carcass, but the ration had no significant effect upon the distribution of fat in the edible portion.

Effect of initial weight, range-feeding, and fattening on gain and edible portion in Barred Plymouth Rock cockerels, W. A. and A. J. G. MAW (*Sci. Agr., 19 (1939), No. 11, pp. 657–661*).—A group of Barred Plymouth Rock cockerels was placed on range at 10 weeks of age. From this group 25 individuals were removed at different growth stages of approximately 2, 3, 4, 5, and 6 lb.

weight, and their growth over a 14-day fattening period was compared with that of comparable birds remaining on range. The smaller birds made relatively higher gains in weight with less feed consumed per unit of gain during fattening, while birds in the 4- and 5-lb. classes did not gain appreciably more when fattened than birds of similar weight on the range.

Fine versus coarse grit as a feed ingredient for poultry, A. E. TEPPER, R. C. DURGIN, and C. A. BOTTORFF (*New Hampshire Sta. Cir. 56 (1939), pp. 8*).—Three lots of chicks were fed in a like manner, except that lot 1 received 1 percent of chick-size granite grit; lot 2, 1 percent of fine granite waste; and lot 3, no grit. There was little difference between the groups in rate of growth or efficiency of feed utilization to 4 weeks of age. Beyond this age the feeding of grit increased the efficiency of feed utilization. The fine granite waste was not detrimental to chick growth during the initial 16-week period. However, histological examination of the intestinal tract at intervals revealed that rather extensive damage to the inner lining of all organs was caused by this fine grit. Pullets from these respective groups carried in individual cages for a period of 31 weeks indicated that the fine grit had a cumulative detrimental effect reflected in lower egg production and a higher feed requirement per dozen eggs produced than for the group receiving no grit, which, in turn, was excelled by the birds receiving coarse grit.

Some histopathologic observations on chicks deficient in the chick antidermatitis factor or pantothenic acid, P. H. PHILLIPS and R. W. ENGEL (Wis. Expt. Sta.). (*Jour. Nutr., 18 (1939), No. 3, pp. 227–232, figs. 4*).—In this study a chick-dermatitis-producing basal diet was variously supplemented with (1) antidermatitis factor concentrate, (2) riboflavin, (3) riboflavin, vitamin B_1, and nicotinic acid, (4) antidermatitis factor plus riboflavin, (5) 10 percent blackstrap molasses, and (6) synthetic pantothenic acid. Groups receiving 1 and 2 percent of liver served as positive controls. In practically all cases chicks suffering from dermatitis showed a definite neuropathology of the spinal cord. Other derangements frequently accompanying dermatitis were thymus involution, liver damage, fatty livers, and keratitis and dermatitis in the skin. Neither riboflavin alone nor the combination of riboflavin, B_1, and nicotinic acid were effective in preventing the pathology of the spinal cord. The antidermatitis factor concentrate, molasses, and the synthetic pantothenic acid each proved highly effective in this respect, leading to the conclusion that pantothentic acid is necessary for the prevention of this disorder in chicks suffering from dermatitis.

The relation of body measurements to the fattening gains and the percentage of edible flesh in the fowl, A. J. G. and W. A. MAW (*Sci. Agr., 19 (1939), No. 9, pp. 589–596*).—Data obtained from 243 birds representing 3 pure breeds and 5 crossbred lots were analyzed. Of the 5 measurements taken, length of body was found to have the greatest weight in influencing the fattening gains. In general, increased length and depth of body were associated with increased gains, while birds with longer legs and keels had smaller gains. Body measurements showed little relationship to percentage of edible flesh. As body length increased, edible flesh decreased, but other regressions were not significant.

Microbiology in the preservation of the hen's egg, R. B. HAINES (*[Gt. Brit.] Dept. Sci. and Indus. Res., Food Invest., Spec. Rpt., 47 (1939), pp. IV+65, pls. 3, figs. 6*).—A comprehensive review dealing with the microbiology of the egg during laying, after laying, and during storage. A bibliography of 158 references is appended.

DAIRY FARMING—DAIRYING

[Investigations with dairy cattle and dairy products], K. S. MORROW H. C. MOORE, and H. C. WOODWORTH (*New Hampshire Sta. Bul. 313 (1939), pp. 6, 19, 20*).—Progress results (E. S. R., 79, p. 529) are noted on the value of cod-liver oil as a supplement to skim milk for calves, factors affecting the variability in milk solids-not-fat, and the effect of failing pastures on milk production.

[Investigations with dairy cattle and dairy products in New Jersey] (*New Jersey Stas. Rpt. 1938, pp. 10–12, 33, 34, 35, 36, 37, 38*).—Brief progress reports (E. S. R., 79, p. 382) are presented for the following investigations: The relation between color, fat, ascorbic acid, and flavor in the milk of Guernsey cows; the value of grass silage for dairy heifers and milking cows; the loss of nutrients during the ensiling of field crops; the improvement of pastures and grassland through fertilization and improved management practices; the relation of certain endocrine secretions to milk and butterfat production; the vapor-vacuum sealing of milk as a method of retarding oxidized flavor development; the use of special types of electric lamps for sterilizing dairy equipment and utensils; a method for determining ascorbic acid in milk; and a critical study of the bio-assay procedure for determining the potency of vitamin D milks.

Inbreeding and outbreeding Holstein-Friesian cattle in an attempt to establish genetic factors for high milk production and high fat test, J. W. BARTLETT, R. P. REECE, and J. P. MIXNER (*New Jersey Stas. Bul. 667 (1939), pp. 31*).—Included are a full discussion of the methods employed in this experiment, the pedigrees of the four foundation sires and other sires which have played an important role in the experiment, data on the sires including daughter-dam production comparisons, and data on the growth performance of inbred and outcrossed heifers. It is concluded that inbreeding of dairy cattle is feasible providing a rigid system of selection is followed. Inferior animals resulting from inbreeding are caused by the mating of genetically inferior animals and not by the system of mating. Growth rates of inbred heifers were not significantly different from those of outbred animals. The percentage of milk fat has been increased in a large percentage of the daughters in this experiment, although it remains to be determined how this increase was obtained.

Feeding dairy cattle, C. B. BENDER (*New Jersey Stas. Cir. 392 (1939), pp. 26, figs. 3*).—This supersedes Circular 302 (E. S. R., 71, p. 523).

A comparison of the vitamin A potency and carotene content of different types of silage, M. W. TAYLOR, W. C. RUSSELL, and C. B. BENDER. (N. J. Expt. Stas.). (*Jour. Dairy Sci., 22 (1939), No. 8, pp. 591–597*).—Carotene analyses (average of three) and vitamin A bio-assays were carried out on nine samples of silages, including two of regular corn silage and one each of corn, oats, soybean, and grass-molasses silages and of soybean-corn, alfalfa, and corn A. I. V. silages. The vitamin A potency per International Unit of carotene in the silages ranged from 1.58 to 2.33 (average 1.8) U. S. P. units as compared with a potency of 1.57 U. S. P. units of vitamin A per unit (0.6 μg) of International Standard carotene. The magnitude of differences in vitamin A potency of the silages indicated that carotene analysis is a reliable index of their vitamin A potencies.

The utilization of simple nitrogenous compounds such as urea and ammonium bicarbonate by growing calves, E. B. HART, G. BOHSTEDT, H. J. DEOBALD, and M. I. WEGNER. (Wis. Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 10, pp. 785–798, figs. 6*).—In two separate experiments with growing dairy

calves, a low-protein basal diet was supplemented with urea, ammonium bicarbonate, or casein as sources of dietary nitrogen. In all cases feed intake was equalized to the level of the lowest individual consumption. The rate of growth and the amount and distribution of nitrogen in the blood indicated definitely that nitrogen supplied by urea or ammonium bicarbonate can be utilized for at least a partial supply of protein nitrogen. Calves receiving 43 percent of their total nitrogen supply from urea and casein, respectively, made average daily gains of 1.3 and 1.5 lb., while ammonium bicarbonate supported somewhat less rapid growth. Calves on the basal diet, which showed practically no gain over a 12-week period, immediately resumed growth when urea was added to the ration. Analyses of the tissues at the end of the experiment indicated that the increments in weight on the urea or ammonium bicarbonate rations were of normal composition, similar to that of casein-fed calves. The most probable explanation of the utilization of these simple nitrogenous compounds is the production of protein by bacterial cell multiplication in the rumen and later digestion in the fourth stomach and intestine. Apparently most efficient utilization occurred when some soluble sugar such as corn molasses was included in the ration.

Factors affecting the passage of liquids into the rumen of the dairy calf.—I, *Method of administering liquids: Drinking from open pail versus sucking through a rubber nipple*, G. H. Wise and G. W. Anderson. (S. C. Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 9, pp. 697–705, fig. 1*).—In a preliminary study of this problem calves were sacrificed shortly after feeding and the stomach contents examined. In two of the four calves fed from open pails some milk was found in the rumen and reticulum, while in none of the five calves fed from the nipple pail was milk present in these organs.

In a second study rumen fistulas were established in seven calves. Observations were made through the fistula during both open-pail and nipple-pail feeding for each subject for a total of 945 and 457 observations, respectively. A marked variation in the response of different calves was noted. In 37 percent of the cases of open-pail feeding some milk entered the rumen, though rarely in quantities equivalent to the major portion consumed. When milk was sucked through a valved nipple it entered the rumen cavity in only about 2 percent of the cases, but never in significant amounts. Water consumed from open pails frequently flowed into the rumen in amounts almost equal to the quantity consumed, while water sucked from the nipple occasionally spurted into the rumen but never in significant amounts, indicating that sucking produces a stimulus causing the esophageal groove to function.

Relation of size of cow to production and cost of production of milk on 94 grade A farms in the Tully-Homer area, 1937, E. G. Misner ([N. Y.] *Cornell Sta. Bul. 719 (1939), pp. 25, figs. 7*).—The data analyzed in this study included the production records and body measurements obtained from 2,747 dairy cows of various breeds (E. S. R., 80, p. 124). The index of size of cow as used in this study represents the sum of three body measurements, and the average measurements of these cows, of which about 78 percent were Holsteins, were 20.8 in. wide at the hips, 18.7 in. long at the rump, and 50.9 in. high at the hips, a total of 90.4 in. A difference of 1 mo. in age between 2 and 5 yr. was accompanied by an average difference of 0.11 in. in index value. The correlation coefficients between the index value in inches and average milk production, average fat production, and average production of 4-percent fat-corrected milk were 0.61, 0.46, and 0.54, respectively. An increase of 1 in. in index of size of the cow was accompanied by an increase in fat production of 11 lb., while a 10-percent increase in index value was accompanied by a 34-percent increase in fat production. The average production per cow for both large

and small animals was somewhat greater in small herds than in large herds. The total cost of production averaged 16 percent less for large cows than for small cows. With large herds of large cows the cost of butterfat production was 7 ct. per pound less than with small herds of small cows, and the advantage of large cows is even greater than indicated by this figure because of the possibility of developing a larger size of business with the same building and equipment investment. The difference in the value placed on large and on small cows by the dairyman was greatest between the ages of 3 and 6 yr. The average values placed on cows by dairymen were essentially the same for those purchased and those raised on the farm. Measurements of a selected group of purebred Holstein cows showed correlation coefficients of 0.61 between age and index of size and of 0.81 between heart girth and index of size.

Proceedings, thirtieth annual meeting, November 29th and 30th, 1938 (*Amer. Butter Inst., Proc. Ann. Mtg., 30 (1938), vol. 1, pp. [47], pl. 1, figs. 10*).—The following additional (E. S. R., 81, p. 703) listed papers are published in full: Population Prospects and Agricultural Implications, by O. E. Baker (U. S. D. A.); Color and Its Relation to Market Appeal, by H. C. Jackson (Univ. Wis.); Economy in Milk and Cream Production—Lessons From Europe, by C. N. Shepardson (Tex. A. and M. Col.); Thirty Years of Progress in the Dairy Industry, by O. E. Reed (U. S. D. A.); and Holding Butter Customers, by M. G. Bush.

The chemistry of milk, W. L. DAVIES (*London: Chapman & Hall, 1939, 2. ed., pp. XIV+534, figs. 27*).—A second edition of this treatise (E. S. R., 77, p. 3).

Composition of milk of Brown Swiss cows, with summary of data on the composition of milk from cows of other dairy breeds, O. R. OVERMAN, O. F. GARRETT, K. E. WRIGHT, and F. P. SANMANN (*Illinois Sta. Bul. 457 (1939), pp. 573–623, figs. 55*).—Detailed information on the composition of milk of Brown Swiss cows, along with a summary of the composition of milk of the other common dairy breeds previously reported (E. S. R., 61, p. 466), is presented. The 428 samples of milk from Brown Swiss cows ranged from 2.92 to 6.48 percent butterfat, 7.99 to 11.44 percent solids-not-fat, and 11.44 to 17.32 percent total solids. Considering all milk samples (2,426) the maximum percentages of fat, protein, lactose, ash, total solids, and solids-not-fat were, respectively, 3.22, 2.66, 2.78, 1.77, 1.7, and 1.65 times the minimum percentages. Equations and graphs showing the regression of each analytical value upon every other one for each breed and for all breeds are included.

Differences in adsorption of solid and liquid fat globules as influencing the surface tension and creaming of milk, P. F. SHARP and V. N. KRUKOVSKY. (Cornell Univ.). (*Jour. Dairy Sci., 22 (1939), No. 9, pp. 743–751, figs. 2*).—The surface tension and creaming qualities were determined under standard conditions for a series of reconstituted milks made by various combinations of creams and skim milks separated at high and at low temperatures, i. e., when fat globules were in a liquid and a solid state, respectively. The results obtained supported the hypotheses that the clumping of the fat globules which results in gravity creaming is produced by an agglutinating substance and that this substance is adsorbed on the surface of the solid or solidifying fat globules but not on the surface of the liquid fat globules. This agglutinating substance is concentrated in cream separated at low temperatures and is relatively absent in the corresponding skim milk, and it is relatively low in cream separated at high temperatures but is present in the corresponding skim milk. This difference in adsorption due to differences in the physical state of the fat markedly affects surface tension, foaming, and gravity creaming. It was possible greatly to concentrate the agglutinating substance by first separating cream at a low

temperature and then separating it to a higher fat content at a higher temperature at which the fat is liquid. The plasma attained in this manner was very active in agglutinating power.

Some factors affecting the stability of certain milk properties, I, II. (N. J. Expt. Stas.). (*Jour. Dairy Sci., 22 (1939), Nos. 9, pp. 717–727; 10, pp. 813–819, fig. 1*).—The results of two studies are noted.

I. *Effect of succulent roughages on flavor*, O. F. Garrett, G. H. Hartman, and R. B. Arnold.—The milks compared in this study were secured from cows receiving alternately beet pulp, corn silage, and molasses-grass silage. The usual grain ration and low-quality field-cured hay were fed throughout the experiment. Weekly samples from each cow were subdivided to give raw and pasteurized milks, each with and without the addition of a small amount of soluble copper. All samples were scored when fresh and at frequent intervals during storage. Milk produced on the molasses-grass silage ration had a greater intensity of yellow color, a superior initial flavor, a more stable flavor in storage, and a greater stability toward the catalytic effect of added copper than milk produced on either the beet pulp or corn silage rations. The feeding of grass silage entirely prevented oxidized flavor development in milk uncontaminated with copper and greatly retarded the development and lessened the intensity of the flavor when copper was added, which is attributed at least in part to the high carotene content of this feed. It also appeared to retard development of hydrolytic rancidity in milk. A significant positive correlation between yellow color and flavor of freshly drawn milk and a significant negative correlation between yellow color of the fresh milk and the loss of flavor in this milk during storage were established.

II. *Effect of succulent roughages and of storage conditions on color*, O. F. Garrett, R. B. Arnold, and G. H. Hartman.—The report of the milk color phase of the study indicates average color intensities of 5.26, 4.57, and 4.22 lactochrometer units in milks produced on the grass silage, corn silage, and beet pulp rations, respectively. A small but definite progressive loss of total yellow color of milk occurred during storage. This loss was accelerated by pasteurization and still more by the addition of soluble copper. High-colored milks proved more stable against color loss in storage than low-colored milks. It is hypothesized that the loss of yellow color is due to the deterioration of xanthophyll and zeaxanthin and that these carotenoids exhibit antioxidative protection toward the carotene in butterfat.

The influence of the physical character of the roughage on the per cent of fat secreted in the milk, D. Espe and C. Y. Cannon. (Iowa Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 10, pp. 799–801, figs. 2*).—A summary of two double-reversal feeding trials with milking cows, in which the animals alternately received uncut and finely chopped roughages, gave evidence that the fat content of the milk was little affected by the physical character of the roughage fed. These results failed to confirm a report by Powell (E. S. R., 81, p. 402).

The effect of advanced lactation in the cow on the physical and chemical composition of the milk, R. B. Little (*Jour. Dairy Sci., 22 (1939), No. 9, pp. 689–695*).—Working with three herds of cows under monthly laboratory observation and selecting only animals in which the milk failed to show the presence of mastitis streptococci or alteration due to staphylococci or other organisms, data were obtained on the pH, percentage of chlorides, leucocyte count, and bacterial count of milk during early and late stages of the lactation period. Milk produced after 8 mo. of lactation had a higher pH, percentage of chlorides, and cell content than milk from the same cows produced during the first 4 mo. of the same or succeeding lactation periods. It is suggested that prolonged milking is conducive to certain physical and chemical changes in the

secretion which affect the normal bacteriostatic substance in milk, and that these changes not only increase the susceptibility of the gland to bacterial multiplication but may also result in a low-grade physical change in the secretory tissue which eventually shortens the productive life of the cow.

Water sorption by dry milk solids.—II, The relation between volume contraction and the degree of sorption, E. L. JACK. (Univ. Calif.). (*Jour. Dairy Sci., 22 (1939), No. 9, pp. 761–766, fig. 1*).—Continuing this study (E. S. R., 81, p. 706), curves were constructed from the data on the volume contraction of dry milk solids which, when extrapolated to zero water concentration and zero contraction, gave values for maximum volume contraction and maximum degree of sorption for each sample. Samples dried by the roller process showed maximum volume contraction values ranging from 42.6 to 57.5 mm.^{3} per gram of dry material and those dried by the spray process from 69.2 to 102 mm.^{3}. These values correspond to degrees of sorption, expressed as percentage of the weight of the solids, of 15.1, 18.5, 23.9, and 36.3 percent, respectively. The volume contraction: degree of sorption ratio was found to be 2.88, which is slightly below the expected value. This is attributed to the hydration of lactose in solution, with no accompanying volume contraction within the limits used.

The relation of phospholipids to fat in dairy products, B. HEINEMANN (*Jour. Dairy Sci., 22 (1939), No. 9, pp. 707–715, figs. 4*).—Analysis of a series of dairy products revealed the following lecithin contents: Skim milk, 0.015–0.018 percent; raw whole milk, 0.035–0.036; skim milk from reseparated cream, 0.035–0.093; pasteurized sweet cream, 0.066–0.199; buttermilk, 0.114–0.126; butter, 0.153–0.212; and separator slime, 0.229 percent. The lecithin was present both in the plasma and the fatty phase, with the relative amount contained in the plasma increasing and that associated with the fat decreasing as the fat content of the product increased, except in the case of buttermilk or skim milk from reseparated cream. In these latter products the proportion of lecithin in the fat and plasma was essentially the same as that in the butter or heavy cream from which they were derived.

Rapid photoelectric determination of carotenoid in milk fat, D. B. HAND and P. F. SHARP. (Cornell Univ.). (*Jour. Dairy Sci., 22 (1939), No. 9, pp. 729–735, figs. 2*).—The described method consists briefly in churning 100-cc. samples of cream, washing the fat with cold water, melting, and centrifuging until clear; transferring a 3-cc. portion to an absorption cell and warming to about 75° C. to produce a clear solution; and determining the light absorption for blue light in a photoelectric colorimeter. The carotenoid content in milligrams per liter of melted fat is calculated with the aid of a calibration curve obtained with pure carotene dissolved in cottonseed oil.

The carotenoid content of milk fat, P. F. SHARP and D. B. HAND. (Cornell Univ.). (*Jour. Dairy Sci., 22 (1939), No. 9, pp. 737–741, figs. 2*).—Employing the above method, a large number of milk samples were analyzed. The average carotenoid contents of these samples were as follows: Commercial market milk (winter) 3.38 mg. per liter of melted fat (range 1.51–7.19); commercial market milk (summer) 10.15 (range 4.85–24.6); winter milk of the Holstein, Jersey, and Guernsey breeds, 3.49, 5.87, and 8.5 mg., respectively; and summer milk of the same breeds, 5.78, 10.5, and 16.4 mg., respectively. Individual variations within the breeds were much greater than the variations among average values for the different breeds.

The riboflavin value of milk, M. M. KRAMER, R. M. DICKMAN, M. D. HILDRETH, B. L. KUNERTH, and W. H. RIDDELL. (Kans. Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 9, pp. 753–759, fig. 1*).—In a further report (E. S. R., 80, p. 668), a statistical analysis of the riboflavin values in milk before and after pasture feeding showed no significant difference in the values, indicating that under

the conditions of this study the rations had little effect on the riboflavin content of the milk. Seasonal and climatic effects appeared to be of greater significance in this respect. The average riboflavin content of all samples tested was 2.1 µg. per gram of milk, equivalent to about 542 Bourquin-Sherman units per quart. Generally close agreement was found between the bio-assay values and those obtained by a fluorimetric method, although the latter values were consistently somewhat lower.

The riboflavin content of cow's milk, D. B. Hand and P. F. Sharp. (Cornell Univ.). (*Jour. Dairy Sci., 22 (1939), No. 10, pp. 779–783, fig. 1*).—Using a fluorometric method as described, the riboflavin content was determined on about 400 samples of milk, including samples from individual cows of the various dairy breeds before and after pasture feeding and samples of winter and summer commercial market milks. Riboflavin values ranged from 0.6 to 3.42 mg. per liter of milk, with values in milk from pasture-fed cows ranging approximately 20 percent above those of milk from cows on typical winter rations. However, cows after being fed in winter on phosphoric acid grass silage showed no increase in riboflavin content of milk when allowed access to grass. Consistent breed differences in milk riboflavin values are indicated. A definite inverse relation was found between riboflavin content and level of milk production, the linear correlation coefficient of which was -0.501 ± 0.058 and the negative skew correlation ratio -0.83 ± 0.024.

Factors affecting the vitamin C content of milk, M. Glickstein and J. H. Frandsen. (Mass. State Col.). (*Milk Dealer, 28 (1939), No. 11, pp. 42, 44, 46*).—A review, with 20 references to the literature.

Physiological factors affecting milk flavor, with a consideration of the validity of flavor scores, E. Weaver (*Oklahoma Sta. Tech. Bul. 6 (1939), pp. 56, figs. 8*).—This study was aimed primarily at determining the effects upon milk flavor of the physiological condition of the cows rather than a consideration of commonly recognized causes of off-flavor in milk. A total of 1,641 samples collected from individual cows in a Jersey herd once each week over a period of 140 weeks was considered, four or more qualified judges passing on each sample. Flavor defects were frequently present in these samples, even though the best known practices were adopted in handling the cows. The most common defects in order of frequency were feed, cowy, rancid, stale, salt, flat, sweet, and bitter. The rancid defect was noted chiefly in milk from one family of cows, especially in those which were "high testers." Salt taste was especially frequent in the milk from one individual. There was a slight tendency for flavor to decrease with advancing age of the cows. Flavor scores declined with advancing stages of lactation and gestation, particularly as daily milk yield declined. Low-testing cows generally produced milk of better flavor than high-testing cows. Solids-not-fat content was likewise negatively correlated with flavor, although to a less extent than fat. Best flavors occurred in April and poorest in October, with the monthly trends in flavor score directly opposed to those in fat percentage. Flavor scores as rendered by the various judges varied slightly, but on the whole the results were considered valid and dependable.

Similarity of the oxidized flavor from three sources, D. H. Nelson and C. D. Dahle. (Pa. Expt. Sta.). (*Milk Dealer, 29 (1939), No. 1, pp. 62, 64, 66*).—Three types of milk, one which spontaneously developed oxidized flavor, one in which oxidized flavor was induced by the addition of 2 p. p. m. of copper, and one prepared by emulsifying auto-oxidized tallowy butterfat into fresh skim milk, were compared for flavor. Judges were unable to distinguish any difference between the flavors of these milks except in intensity, and none could identify the sample in which copper-induced flavor was present. Thus it appeared that the spontaneous and copper-induced oxidized flavors were identical.

Factors to be considered in selecting chocolate-flavored milk, W. S. MUELLER. (Mass. Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 8, pp. 623–636, figs. 4*).—In extensive studies conducted on chocolate-flavored milks it was found that the addition of approximately 1 percent of cocoa to whole milk did not decrease the nutritive value of the milk as measured by growth trials with rats and only slightly decreased the digestibility of the milk as determined by in vitro experiments. However, adding 4 percent of cocoa definitely decreased the digestibility and nutritive value of the milk. All chocolate sirups and cocoas studied decreased the curd tension of milk, but no direct relationship between curd tension and nutritive value of chocolate milks could be established. Some commercial chocolate-flavored sirups were of poor sanitary quality and when added to cold milk materially increased the bacterial content of the chocolate milk. No pathogens were found in any chocolate sirup or cocoa examined. The desirability of definite composition and bacterial standards for chocolate milk is stressed. The desirable properties of a good chocolate milk are set forth.

Bacteria in relation to the milk supply: A practical guide for the commercial bacteriologist, C. H. CHALMERS (*London: Edward Arnold & Co., [1939], 2. ed., pp. XII+209, pls. 4, figs. 31*).—A second edition of this treatise is noted (E. S. R., 76, p. 683).

Measuring the bacteriological quality of milk, C. K. JOHNS (*Jour. Milk Technol., 2 (1939), No. 4, pp. 175–180*).—A discussion of the relative merits of the plate count, direct microscopic count, methylene blue reduction test, and resazurin test for determining the sanitary properties of milk.

Information obtained by the microscopic examination of raw milk not shown by the methylene blue test or the standard plate count, W. K. FOX, G. J. TURNEY, and C. S. BRYAN. (Mich. Expt. Sta. et al.). (*Milk Dealer, 28 (1939), No. 12, pp. 42, 44, 46, 48*).—A further report of research previously noted (E. S. R., 80, p. 536).

The effect of low temperature on Streptococcus lactis, O. RAHN and F. M. BOGWOOD. (Cornell Univ.). (*Arch. Mikrobiol., 10 (1939), No. 1, pp. 1–5, fig. 1*).—In this study sterile skim milk was inoculated with a pure culture of *S. lactis* and incubated until 0.4 percent acidity was attained. This culture was then divided into four sublots, which were treated to give lots neutralized and unneutralized each with and without air (air replaced by nitrogen). All were then held at 0° [C.], samples of each being removed after 7, 24, 57, 85, and 114 days and tested for viability. The number of living cells decreased rather slowly for about 1 mo., while after 3 mo. the number of viable cells was reduced to a few thousands. Death was partially attributed to accumulated acid, but mainly to the effect of oxygen. Neutralization and replacement of free oxygen by nitrogen prolonged the viability of the culture. When held at a temperature below the growth minimum the enzyme content of the bacterial cells decreased, and recovery was very slow when favorable temperature was restored.

Definition versus measurement of optimal temperature, F. L. DORN and O. RAHN. (Cornell Univ.). (*Arch. Mikrobiol., 10 (1939), No. 1, pp. 6–12, fig. 1*).—This study showed that various functions of bacteria do not always have the same optimal temperature. Strains of *Streptococcus lactis* and *S. thermophilus*, respectively, showed the most rapid rate of growth at 34° and 37° [C.], the largest number of cells at 25°–30° and 37°, the most rapid rate of fermentation at 40° and 47°, and the largest amount of acid formation at 30° and 37°.

High bacterial counts in pasteurized milk—some factors involved, H. MACY. (Univ. Minn.). (*Milk Plant Mo., 28 (1939), Nos. 7, pp. 37, 38, 40; 8, pp. 56, 57*).—This report includes a general discussion of the subject, with data on the relation between raw and pasteurized milk counts, particularly as affected by season; the relation between total and thermophile counts in raw and pas-

teurized samples; and the types and thermal death point of cultures isolated from pasteurized milk. Definite evidence is offered to indicate that pasteurization does not encourage laxity in milk production.

Treatment of paper milk bottles, C. D. DAHLE and D. V. JOSEPHSON. (Pa. Expt. Sta.). (*Milk Dealer, 28 (1939), No. 11, pp. 39, 66, 68, 69*).—Attempts have been made to utilize the antioxidative properties of oat flour by using this material in the treating of paper milk bottles to prevent or delay the development of oxidized flavor in milk. Mixing oat flour with paraffin for coating the inner bottle surface resulted in a definite, high degree of protection against oxidized flavor development in the milk. However, this procedure resulted in an oat flour flavor in the milk, and, furthermore, the paraffin tended to peel from the bottle, followed by a softening and bulging of the bottle. In further trials, cardboard stock from which bottles were to be made was sized in a bath containing a 10-percent oat flour solution. Bottles fabricated from this treated stock and paraffined in the conventional manner definitely inhibited the rate of copper-induced oxidized flavor as compared with milk in untreated containers when the bottles were held in darkness or exposed to sunlight.

Controlling the bacterial content of the fibre bottle cap, J. W. RICE. (N. Y. State Expt. Sta.). (*Pa. Assoc. Dairy Sanit. Ann. Rpt., 15 (1939), pp. 98–105*).—A general discussion, with recommendations for keeping down bacterial contamination of fiber bottle caps at various stages in the manufacturing and packaging process.

The effect of temperature upon score value and physical structure of butter, W. H. E. REID and W. S. ARBUCKLE (*Missouri Sta. Bul. 408 (1939), pp. 11, figs. 7*).—Similar samples of a single lot of butter were tempered in chambers automatically held at 40°, 50°, 60°, and 70° F., respectively, for 4 hr. and then scored for quality in the conventional manner. Under this plan butter eligible to a high commercial score generally received a higher score at 70° than at 40°, while butter of medium to low score generally scored higher at 40° than at 70°. Flavors of butter were full and pronounced at 70° unless the salt content was sufficiently high to submerge the true flavors, while at 40° flavors were less distinct. These findings are directly applicable to the most desirable serving temperature for various grades of butter. The spreading properties of butter appear to be most desirable at 60°, except in those butters having a soft, salvy body, in which case temperatures of from 40° to 50° were more desirable.

The relation of carbon dioxide gas to the keeping quality of butter, W. B. COMBS. (Univ. Minn.). (*Ice and Refrig., 97 (1939), No. 1, p. 3, fig. 1*).—A brief progress report.

Factors affecting amount of mold mycelia in butter, J. ADAMS and E. H. PARFITT. (Purdue Univ.). (*Natl. Butter and Cheese Jour., 30 (1939), No. 10, pp. 29, 30, 32, 36*).—A report of research previously noted (E. S. R., 81, p. 706).

Butter storage, F. L. PARSONS, W. H. and D. L. MARTIN, and D. MURRAY. (Kans. Expt. Sta.). (*Natl. Butter and Cheese Jour., 30 (1939), Nos. 5, pp. 16, 18; 6, pp. 50–52*).—A study of economic factors involved in the storage of butter led to the following conclusions: Butter to be stored should be made from high-quality cream of low acidity and efficiently pasteurized, the butter to be protected from contamination during manufacture and storage. Shrinkage of butter in storage is a relatively small risk factor. The peak quantity of butter in storage usually occurs between August and October and represents about 8.5 percent of the annual production, while the minimum quantity in storage is usually reached in April and represents about 0.5 percent of the annual production. Actual storage costs for 6 mo. averaged about 1.58

ct. per pound. Hedging costs would increase this total to about 1.86 ct. Hedging is considered justifiable when a definite profit can be realized at the time butter is placed in storage and when indications point to a declining market during the out-of-storage season. A knowledge of factors which will affect price changes in butter is essential in the estimation of a butter-storage policy.

A study of winter- and summer-made Cheddar cheese, J. C. Marquardt. (N. Y. State Expt. Sta.). (*Natl. Butter and Cheese Jour., 30 (1939), No. 9, pp. 28, 30, 32, 34, 36*).—Samples of commercial Cheddar cheeses, including winter-made Canadian, summer-made Wisconsin, and both winter- and summer-made New York cheeses, and also experimental cheeses made from raw and pasteurized milks both in winter and summer and cured at various temperatures, were used in this study. In addition to the usual flavor score, a scheme for numerically indicating the intensity of cheese flavor is described. The results of this study give evidence that the numerical score without a cheese flavor intensity designation is of little value in indicating true cheese flavor. Winter cheeses did not develop as desirable flavor as summer cheeses, particularly when held at lower curing temperatures. Curing at low temperatures with short periods at higher temperatures appeared to be the best solution to developing cheese with desirable flavor and free from defects. An initial curing temperature of from 35° to 40° F. for 2 weeks is considered desirable when the force curing of cheese at higher temperatures for periods of less than 2 weeks is to be followed. The importance of curing-room temperature control is stressed.

Proposed changes in scoring Cheddar cheese, J. C. Marquardt. (N. Y. State Expt. Sta.). (*Natl. Butter and Cheese Jour., 30 (1939), No. 4, pp. 12, 13*).—The proposed changes in the score card for Cheddar cheese differs from the present approved score card by providing 5 points for salt in addition to the usual consideration of flavor, texture and body, color, and finish. Cheese containing from 1.5 to 1.7 percent salt would be allowed a perfect score of 5 points, while salt contents ranging above or below this range would receive progressive cuts, with those having below 0.9 or about 2.4 percent salt receiving a 0 score on this point. The desirability of expressing the degree of cheese flavor in connection with flavor score is also discussed.

Factors affecting activity and heat resistance of Swiss cheese starter cultures.—II, Influence of culture medium, P. R. Elliker and W. C. Frazier. (Univ. Wis.). (*Jour. Dairy Sci., 22 (1939), No. 10, pp. 821–830*).—Continuing these studies (E. S. R., 81, p. 102), it was found that *Lactobacillus helveticus*, *L. lactis*, and *Lactobacillus* sp. all developed more actively in freshly prepared sterile reconstituted skim milk than in a similar medium which had been held for a number of days. However, the age of this medium had no influence on the growth of *Streptococcus thermophilus*, *S. lactis*, or *Escherichia coli*. The addition of growth stimulants such as peptone, tomato juice, yeast water, or lactic filtrate stimulated the growth of *L. helveticus* in both old and freshly prepared sterile reconstituted skim milk. The oxidation-reduction potential of this freshly prepared medium was significantly lower than that of old lots, and the addition of a reducing substance, neutralized thioglycolic acid, to the old material stimulated development of the above lactobacilli but not of *S. lactis*, *S. thermophilus*, or *E. coli*. A succession of transfers of *L. helveticus* into old and freshly prepared lots of the medium resulted in a gradual decrease and increase, respectively, in the activity of the culture. Cultures grown at 40° C. in the old medium were more active following heating than those grown at 37°, while the reverse was true for those in a freshly prepared medium.

"Rusty spot" in cheese, R. S. Breed and C. S. Pederson *(Farm Res. [New York State Sta.], 5 (1939), No. 4, p. 1)*.—This common cheese defect has been found due to the action of color-producing strains of lactic acid, rod-shaped bacteria commonly found in milk and whey. The practical recommendation made for controlling this problem is a general clean-up of the factory and complete sterilization of all utensils and equipment.

The effect of composition and serving temperature upon consumer acceptance and dispensing qualities of ice cream, W. H. E. Reid, R. J. Drew, and W. S. Arbuckle *(Missouri Sta. Res. Bul. 303 (1939), pp. 44, figs. 30)*.—The comparative consumer preference for a series of ice creams varying in percentage of butterfat, sugar, and serum solids and served at various temperatures led to the conclusion that an ice cream containing about 14 percent fat, 14 percent sugar, 13 percent serum solids, and 0.3 percent gelatin and served at a temperature of approximately 10° F. was most generally preferred. As the serving temperature increased from 6° to 18° the vanilla flavor became more pronounced, the ice creams were sweeter, and high fat ice creams were less criticized for being buttery and were considered to be more desirable. As the fat, serum solids, or sugar content was increased the ice crystals became smaller and were surrounded more abundantly with noncrystalline material, and a closer and more desirable texture was evident. The optimum ratio between water in the frozen and unfrozen form which resulted in the most stable ice cream when exposed at 85° was materially affected by the serving temperature and the composition of the mix. The stabilizing effect of increased sugar or serum solids was much more affected by the serving temperature than that of increased fat or gelatin. Factory-filled cartons of ice cream were more stable than hand-packed ice cream when exposed at 85°.

The composition and serving temperature as a means of increasing consumer preference for ice cream, W. H. E. Reid, R. J. Drew, and W. S. Arbuckle. (Mo. Expt. Sta.). *(Internatl. Assoc. Ice Cream Mfrs. Ann. Conv., Cleveland, Rpt. Proc., 38 (1938), vol. 4, pp. 76–81, figs. 11)*.—A report of the research noted above.

Alpha hydrate and beta anhydride lactose crystals in sandy ice cream, C. W. Decker, W. S. Arbuckle, and W. H. E. Reid *(Missouri Sta. Res. Bul. 302 (1939), pp. 22, figs. 11)*.—By isolating the sandy material from high serum solids ice cream (methods described) and examining it under the petrographic microscope it was found that α-hydrate and β-anhydride lactose, with the former predominating, were the only substances in the sandy material. The optical properties of these isloated crystals are indicated. Commercial ice creams in which sandiness was detectable in the mouth showed the presence of α-lactose crystals in the process of formation. The almost complete absence of β-lactose crystals in such ice cream is attributed to the fact that insufficient time had elapsed to permit this type to form and develop. Sandiness did not develop in a high serum solids ice cream held constantly at —10° F. for 12 mo., while pronounced sandiness developed in a sample of this ice cream held in a dispensing cabinet at 6° and 10° for 3 mo. and subsequently held for 5 mo. at —10°, thus indicating the influence of variable storage temperatures.

Kind and amount of sugar play a major role in frozen desserts, A. C. Dahlberg *(Farm Res. [New York State Sta.], 5 (1939), No. 4, pp. 1, 2, figs. 2.)*—The approximate amount of sugar used by the ice cream industry; the relative importance of cane, beet, and corn sugars in ice cream production; and ways of utilizing sugar to improve the quality of ice cream are indicated.

Report of committee on ice cream sanitation, F. W. Fabian et al. *(Jour. Milk Technol., 2 (1939), No. 4, pp. 193–196)*.—A brief discussion of recently adopted measures governing the sanitary control of frozen dairy desserts.

VETERINARY MEDICINE

A textbook of veterinary physiology, A. SCHEUNERT, A. TRAUTMANN, and F. W. KRZYWANEK (*Lehrbuch der Veterinär-Physiologie. Berlin: Paul Parey, 1939, pp. VIII+449, figs. 169*).—A work on comparative physiology presented in nine parts without references to the literature.

Principles of hematology, R. L. HADEN (*Philadelphia: Lea & Febiger, 1939, pp. 348, [pl. 1], figs. 155*).—This work, presented in 25 chapters and including many illustrative cases, has been prepared with a view of simplifying the study of disorders of the blood.

[Work in animal pathology by the Arizona Station] (*Arizona Sta. Rpt. 1938, pp. 36, 72, 73*).—A brief report of the work of the year (E. S. R., 79, p. 534) includes studies of plants poisonous to range stock, losses of sheep due to sudden changes from dry grasses and browse to green rapidly growing barley or alfalfa pasture and of sheep and lambs due to overheating, the use of potassium iodide in the drinking water for the control of actinomycosis, and infectious rhinitis in a large herd of breeding hogs.

[Work in animal pathology by the New Hampshire Station] (*New Hampshire Sta. Bul. 313 (1939), pp. 20, 21, 31, 32*).—The work of the year referred to (E. S. R., 79, p. 535) includes the control of infectious abortion in cattle (Bang's disease), Bang's disease testing, the finding that rickets in young chicks is not caused by chronic coccidiosis, and fowl pox vaccine distribution, all by C. L. Martin; control of bovine mastitis through prevention, by L. W. Slanetz, Martin, and K. S. Morrow; pullorum eradication; studies on the control of coccidiosis in poultry, by Martin, T. B. Charles, and R. C. Durgin; epidemic tremors, by C. A. Bottorff, A. E. Tepper, Durgin, and Charles; laryngotracheitis vaccine distribution, by Bottorff; and poultry autopsies, by Bottorff and Martin.

[Work in animal pathology by the New Jersey Stations] (*New Jersey Stas. Rpt. 1938, p. 96*).—The work of the year (E. S. R., 79, p. 390) reported includes an investigation of infectious laryngotracheitis and a study of fowl paralysis.

[Studies in comparative pathology, etc., in Japan] (*Jour. Jap. Soc. Vet. Sci., 17 (1938), Nos. 1, pp. 1–126, pls. 2, figs. 25, pp. 1–15; 2, pp. 127–183, pls. 6, figs. 2, pp. 17–24; 3, pp. 185–223, pl. 1, figs. 4, pp. 25–87, pls. 16; 4, pp. 225–292, pls. 4, pp. 89–137, pls. 3, figs. 10*).—The contributions presented in No. 1 (E. S. R., 79, p. 244) are: Anti-Vaccinial Serum and Its Anti-Viral Body, by S. Nagahata and S. Ikegaya (pp. 1–17, Eng. abs. pp. 1, 2); Studies on Blackhead—III, Test of Surgical Operation, Immunology, and Chemotherapy, by D. Niimi (pp. 18–57, Eng. abs. pp. 3–5) (E. S. R., 79, p. 245); Formosan Trombidiid Larva—II (Acarina: Trombidiidae), With Description of a New Species [*Trombicula isshikii*], by M. Sugimoto (pp. 58–62, Eng. abs. pp. 6, 7); Studies on Contagious Abortion in Cattle—I, Epizootiological Observations on *Brucella* Abortion Among Cows at the Yamuyingtzu Stock-Farm, Near Wangyehmiao, Inner Mongolia, Manchukuo, by K. Itabashi, S. Ito, S. Watanabe, Y. Tajima, and K. Harako (pp. 63–77, Eng. abs. pp. 8–10); Studies of a Fowl Pest Occurring Epizootically in Manchukuo—I, Contribution to the Knowledge of the Symptomatology of Fowl Pest [trans. title], by S. Yamagiwa and M. Niwa (pp. 78–117, Ger. abs. pp. 11–13); and A Modification of the Tetrathionate Medium for the Isolation of *S[almonella] abortivo-equina*, by K. Hirato (pp. 118–126, Eng. abs. pp. 14, 15).

Contributions in No. 2 include: Studies of a Fowl Pest Occurring Epizootically in Manchukuo—II, A Noteworthy Characteristic of the Fowl Pest Virus [trans. title], by S. Yamagiwa (pp. 127–138, Ger. abs. pp. 17, 18) (see above), and III, The Immunological Relation of the Manchurian Fowl Plague Virus to the

Viruses of Fowl Pest and Similar Diseases of the Fowl [trans. title], by S. Yamagiwa and M. Niwa (pp. 139–151, Ger. abs. pp. 19, 20); On a Nematode, *Strongyloides papillosus* Wedl 1856, From Sheep, by J. Fujita (pp. 152–169, Eng. abs. pp. 21, 22); and Uterine Movement and the Oestrual Cycle in the Guinea Pig, I [trans. title], by Y. Ohkubo and S. Endoh (pp. 170–183, Ger. abs. pp. 23, 24).

Contributions in No. 3 include: On the Experimental Infection With Rinderpest Virus in the Rabbit—I, Some Fundamental Experiments, by J. Nakamura, S. Wagatuma, and K. Fukusho (pp. 185–204, Eng. abs. pp. 25–30); On the Gram-Differentiation of Bacteria by the Simplest Method (pp. 205–207, Eng. abs. pp. 31, 32) and On a Simple Staining Method of Metachromatic Granules in Animal Pathogenic Organisms (pp. 208, 209, Eng. abs. pp. 33, 34), both by E. Ryu; Necrobacillosis of the Deer [trans. title] (Jap. abs. pp. 210, 211, Ger. 35–39) and Multiple Abscesses of the Liver of Cattle Due to Necrobacillosis Bacilli [trans. title] (Jap. abs. pp. 212, 213, Ger. 40–49), both by S. Yamamoto; A Study of the Virus of Equine Infectious Anemia [trans. title], by N. Nakamura, S. Ishii, and S. Watanabe (Jap. abs. pp. 214–216, Fr. 50–63); A Study of the Histopathological Lesions in the Horse Resulting From Equine Infectious Anemia, I, by N. Nakamura, S. Ishii, and W. Watanabe (Jap. abs. pp. 217, 218, Fr. 64–76), II, by N. Nakamura, S. Ishii, and K. Nobuto (Jap. abs. pp. 219, 220, Fr. 77–86); and On the Viability of Anthrax Spores, by S. Umeno and R. Nobata (pp. 221–223, Eng. abs. p. 87).

Contributions in No. 4 include: Researches on Reproduction in Mares—IV, Periodic Changes in Vulva, Vagina, and Cervix, by S. Satō and S. Hoshi (pp. 89–109, Jap. abs. pp. 225–227) (E. S. R., 73, p. 383); The Suppurative Periostitis of Horses by *S. abortivo-equinus* [*Salmonella abortivo-equina*], by H. Oguni and M. Kaibotsu (pp. 228–240, Eng. abs. pp. 110, 111); Experiments on Animals With the Small-Pox Virus With Special Reference to Vaccinization, by S. Akazawa and T. Hotta (pp. 241–255, Eng. abs. pp. 112, 113); On the Infection of Fowl-Pest Virus "Strain Chiba" in Mice, by J. Nakamura and N. Imai (pp. 256–290, Eng. abs. pp. 114–117); and A New Edematous Disease of Chickens Caused by *Streptococcus pyogenes citreus* [trans. title], by H. Kawashima and N. Nakamura (Jap. abs. pp. 291, 292, Ger. 118–137).

[Studies in comparative pathology, etc., in Japan] (*Jap. Jour. Vet. Sci.*, *1* (*1939*), *Nos. 1, pp. 1–124, pls. 6, figs. 3; 2, pp. 157–237, pls. 3; 3, pp. 285–330, pls. 4*).—The contributions presented in No. 1 of this journal (E. S. R., 81, p. 608) are: Experimental Studies on the *Cysticercus cellulosae*, by M. Ohasi (pp. 1–46, Eng. abs. pp. 44–46); On the Variant Types of *Bacillus mallei*—II, Systematic Research on Variant Types, by I. Mochida (pp. 47–74, Eng. abs. pp. 73, 74) (E. S. R., 67, p. 451); Studies on Preparation of Rabies-Vaccine—III, Purification of Rabies-Vaccine by Iso-Electric Point Method, by T. Ogawa (pp. 75–88, Eng. abs. p. 88); Complement-Fixation Reaction in Rinderpest—V, Distribution of Antigen in the Body of the Infected Calf, by J. Nakamura (pp. 89–118, Eng. abs. pp. 115–118) (E. S. R., 79, p. 245); and Demonstration of Granules in Bacteria by a Simple Staining, by E. Ryu (pp. 119–124, Eng. abs. pp. 123, 124).

Contributions in No. 2 include: On the Variant Types of *Bacillus mallei*—III, Virulence, Serological, and Allergic Reactions of Colony Types, by I. Mochida (pp. 157–183, Eng. abs. p. 183) (see above); On the Comparative Studies of Biological Characters Between Equine and Human Hemolytic Streptococci, by T. Nisi (pp. 184–203, Eng. abs. pp. 202, 203); On the Gram-Differentiation of Bacteria by the Simplest Method—II, The Caustic Potash Method, by E. Ryu (pp. 204–210, Eng. abs. pp. 209, 210) (see above); and On the Histo-Pathological Studies of Infectious Anemia in the Horse—III, Observations on Tissue-Iron and Siderocytes, by S. Ishii (pp. 211–237, Eng. abs. pp. 234–237).

Contributions in No. 3 include: On the Blood of the "Corriedale" Sheep, by S. Nagahata, S. Ikegaya, and J. Fujita (pp. 285–300, Jap. abs. pp. 299, 300); On a Culture Medium Suitable for Simple Isolation of *Streptococcus equi* From Strangles Materials, by S. Umeno and R. Nobata (pp. 301–307, Eng. abs. pp. 306, 307); Studies of Leprosy—The Filtrable Form in Rat Leprosy [trans. title], by T. Itihara (pp. 308–314, Ger. abs. pp. 313, 314); and Studies on the Histo-Pathological Changes in the Horse Suffering from Infectious Anemia—IV, Several Observations on the Ovary, by S. Ishii, N. Nakamura, and K. Nobuto (pp. 315–330, Eng. abs. pp. 328–330) (see above).

[Contributions on animal pathology and parasitology] (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 11 (1938), No. 2, pp. 263–337, 385–388, 419–504, pl. 1, figs. 13*).—Contributions presented (E. S. R., 81, p. 570) include the following: Immunization Against Rinderpest, With Special Reference to the Use of Dried Goat Spleen, by G. Pfaff (pp. 263–330); The Isolation of *Cl[ostridium] welchii*, Type B, From Foals Affected With Dysentery, by J. H. Mason and E. M. Robinson (pp. 333–337); Coproporphyrin Excretion in East Coast Fever of Cattle, by G. C. S. Roets (pp. 385–388); and The Blood of the Ostrich, by O. T. de Villiers (pp. 419–504).

[Contributions on animal parasitology] (*Helminthol. Soc. Wash. Proc., 6 (1939), No. 2, pp. 35–57, 77–80, 94–105, figs. 4*).—Among the contributions presented are: Freedom From Viable Trichinae of Frankfurters Prepared Under Federal Meat Inspection, by B. Schwartz (pp. 35–37), Intracutaneous Tests for the Detection of Trichina Infections Experimentally and Naturally Acquired by Swine, by L. A. Spindler and S. X. Cross (pp. 37–42), Methods of Determining the Viability of *Balantidium coli* Cysts, by J. C. Lotze (pp. 42–45), A New Species of Coccidium From Cattle, With Observations on Its Life History [*Eimeria auburnensis* n. sp.], by J. F. Christensen and D. A. Porter (pp. 45–48), Comparative Counts of Infected and Noninfected Erythrocytes in Bovine Anaplasmosis, by C. W. Rees and P. C. Underwood (pp. 48–50), The Effect of Some Halogenated Hydrocarbons on the Eggs of *Toxocara canis* (Nematoda), by J. T. Lucker (pp. 51–57), Preliminary Observations of the Effect on Sheep of Pure Infestation With the Tapeworm *Moniezia expansa*, by D. A. Shorb (pp. 77–79), and Some New Intermediate Hosts of the Swine Stomach Worms *Ascarops strongylina* and *Physocephalus sexalatus*, by D. A. Porter (pp. 79, 80) (all U. S. D. A.); Redescription and Emendation of the Genus *Aproctella* (Filariidae), Nematodes From Gallinaceous Birds, by E. B. Cram (pp. 94, 95); New Genera and Species of Filarioidea—III, *Sarconema eurycerca* n. gen., n. sp., by E. E. Wehr (pp. 95–97), and Helminth Parasites of North American Semidomesticated and Wild Ruminants, by G. Dikmans (pp. 97–101) (both U. S. D. A.); Some Helminthic Parasites Recovered From Domesticated Animals (Excluding Equines) in Panama, by A. O. Foster (pp. 101, 102); Helminth Parasites Collected From Deer (*Odocoileus virginianus*) in Florida, by A. G. Dinaburg (pp. 102–104) (U. S. D. A.); and The Domestic Cat, a New Host for *Thelazia californiensis* Price 1930 (Nematoda: Thelaziidae), by J. R. Douglas (p. 104), and Buffered Solutions in Staining Helminths, by R. Craig and G. M. Spurlock (pp. 104, 105) (both Univ. Calif.).

Observations on an infectious agent from Amblyomma maculatum, R. R. Parker, G. M. Kohls, G. W. Cox, and G. E. Davis (*Pub. Health Rpts. [U. S.], 54 (1939), No. 32, pp. 1482–1484*).—**Two strains of an infectious agent pathogenic for guinea pigs were isolated during the late summer of 1937 from groups of 19 and 28 Gulf coast ticks, respectively, collected from cows near Cleveland, Liberty County, Tex. None of the other species of ticks tested, including the American dog tick, the lone star tick, and the brown dog tick, gave conclusive evidence of the occurrence of pathogenic agents.**

An apparatus for measuring the "flash" thermal death point of microscopic animal organisms and its use with ova of Ascaris lumbricoides, W. E. SWALES and D. K. FROMAN (*Canad. Jour. Res., 17 (1939), No. 8, Sect. D, pp. 169–177, figs. 2*).—A description is given of a method of measuring flash thermal death points of microscopic animal organisms. "By means of the devised apparatus the time of exposure can be varied from 0.5 to 0.1 sec., and the temperature can be estimated with relative accuracy. In a sample determination, the single-celled ova of *A. lumbricoides* (porcine origin) were all destroyed at a temperature of 68° C. in an exposure of 0.44 sec."

Nicotinic acid and thiamin hydrochloride as growth-promoting factors for Brucella, G. P. KERBY (*Jour. Bact., 37 (1939), No. 5, pp. 495–499, figs. 4*).—The growth of *B. abortus* was found enhanced by the addition of nicotinic acid "and thiamin hydrochloride to Bacto Tryptose Agar in concentrations of 30 and 25 mg., respectively, per liter of medium. Growth of certain strains is enhanced more by one than the other of these substances, but all strains grow well when both materials are added. For routine use, the combination seems advisable. The single stock strain of *B. melitensis* studied was inhibited somewhat by either factor. *B. suis* was not investigated."

Human vaccination against equine encephalomyelitis virus with formolized chick embryo vaccine, J. W. and D. BEARD and H. FINKELSTEIN (*Science. 90 (1939), No. 2331, pp. 215, 216*).—In the work reported the crude bivalent vaccine was found to be effective in the induction of antibodies against the eastern strain of equine encephalomyelitis virus and to cause little discomfort. It is thought that vaccines containing less formalin and chick tissue debris may be as effective and more useful for human vaccination.

Ornithodoros parkeri: Distribution and host data; spontaneous infection with relapsing fever spirochetes, G. E. DAVIS (*Pub. Health Rpts. [U. S.], 54 (1939), No. 29, pp. 1345–1349*).—The collection over a 5-yr. period of *O. parkeri*, described by Cooley in 1936 (E. S. R., 75, p. 819), revealed its occurrence in Wyoming, Montana, Utah, Washington, and Colorado, feeding on the ground squirrel, jack rabbit, cottontail rabbit, prairie dog, weasel, and the white-footed mouse. Six strains of spirochetes have been recovered from ticks representing three of the collection areas. It is pointed out that since this tick is the only known likely transmitting agent of relapsing fever in Washington and Utah, where human cases have been reported, and since it has been shown that it is spontaneously infected with spirochetes which produce a relapsing fever in guinea pigs, it is open to suspicion as a transmitting agent to man.

Similarity of Australian "Q" fever and a disease caused by an infectious agent isolated from ticks in Montana, R. E. DYER (*Pub. Health Rpts. [U. S.], 54 (1939), No. 27, pp. 1229–1237, figs. 6*).—Account is given of the points of similarity to and the difference of the Montana infection due to a filter-passing agent first recovered in 1935 from ticks (*Dermacentor andersoni*) collected near Missoula, Mont., and the "Q" fever of Australia.

Microorganisms of the Salmonella choleraesuis group isolated in the United States, D. W. BRUNER and P. R. EDWARDS. (Ky. Expt. Sta.). (*Amer. Jour. Hyg., 30 (1939), No. 2, Sect. B, pp. 75–81*).—The examination made of a number of cultures of the *S. choleraesuis* group demonstrated that the Kunzendorf variety is the predominant type among these bacilli in the United States. *S. choleraesuis*, which formerly predominated, is now found only occasionally. By the use of the A. Wassén[5] technic it was possible to isolate specific com-

[5] Off. Internatl. Hyg. Pub. [Paris], Bul. Mens., 27 (1935), No. 6, pp. 1121–1134, pl. 1.

ponents from all the Kunzendorf strains examined. Three cultures of the Kunzendorf type from swine were found to occur naturally in the diphasic state.

Serological types of Streptococcus uberis, W. N. PLASTRIDGE and L. F. WILLIAMS. ([Conn.] Storrs Expt. Sta.). (*Jour. Bact., 38 (1939), No. 3, p. 352*).—The authors record observations made of the serological properties of 141 cultures identified by biochemical tests as *S. uberis* (Diernhofer), which is apparently identical with group III of the English workers and group Ba (Storrs). "The cultures used produced either weakly beta hemolytic or non-hemolytic colonies on blood agar, split aesculin (Edwards' medium), acidified litmus milk with slight or no reduction, produced variable results in methylene blue milk (1–5,000), usually hydrolyzed sodium hippurate, fermented lactose, mannitol, sorbitol, trehalose, and usually inulin, and failed to ferment raffinose and arabinose. Of 141 cultures examined by the slide agglutination test, 136 were placed in 11 serological types and 5 failed to react with any of the type sera employed. While the majority of the cultures were type-specific, about 20 percent shared a common antigen with more than one serological type.

"On the basis of biochemical characteristics, it appears that *S. uberis* does not belong in the viridans, lactic, and enterococcus divisions of Sherman (1937) [E. S. R., 79, p. 30]. His pyogenic division consists of Lancefield's serological groups A, B, C, E, F, G, and H. Biochemically, *S. uberis* resembles Lancefield's group E more closely than any other group. A minor (group ?) antigenic relationship was observed between our serological type 2 and Lancefield's group E. None of the *S. uberis* cultures were agglutinated by antisera against groups other than group E."

A study of streptococci producing positive Hotis reactions, E. C. MCCULLOCH and S. A. FULLER. (Wash. Expt. Sta.). (*Jour. Bact., 38 (1939), No. 4, pp. 447–459*).—The authors have found in using both unheated milk and sterilized Hotis-negative milk plus blood serum that many organisms, of the genus *Streptococcus* at least, besides *S. agalactiae*, are able to produce the Hotis reaction. "The Hotis reaction appears to be an agglutination reaction, and the alteration of the surface which causes the organisms to clump would cause them to tend to migrate to the surface of the test tube and adhere. It appears that the yellow flakes or balls which form on the side of a tube of bromocresol purple milk after incubation, and which have been considered diagnostic of *S. agalactiae* in the Hotis test, may be produced by any organism which (1) stimulates the production of agglutinins, (2) grows in the presence of 0.025 percent bromocresol purple in a milk medium when incubated in a test tube under aerobic conditions at 37.5° C., (3) forms clumps on the side of the tube when grown in the presence of its agglutinins, [and] (4) produces sufficient acid from lactose to increase the hydrogen-ion concentration to about pH 5.4."

Staphylococcal infection in rabbits: Antibacterial and non-specific immunity, S. T. COWAN (*Jour. Pathol. and Bact., 48 (1939), No. 3, pp. 545–555, figs. 5*).—In work reported rabbits immunized by intravenous inoculation of staphylococcus vaccine (*Staphylococcus pyogenes*) developed some resistance to intravenous infection with the same organism. A similar degree of resistance was produced by intravenous inoculation of a vaccine made from an antigenically unrelated bacterium.

Cultivation of the viruses: A critical review, M. SANDERS (*Arch. Pathol., 28 (1939), No. 4, pp. 541–586*).—This review is presented with a list of 160 references to the literature.

Range plant newly found to be poisonous, A. W. DEEM, F. THORP, JR., and L. W. DURRELL. (Colo. Expt. Sta.). (*Science, 89 (1939), No. 2315, p. 435*).—

Of several native plants suspected of causing the death of cattle in a small herd in northeastern Colorado, *Picradeniopsis oppositifolia* (*Bahia oppositifolia*) was found to have poisonous properties. Not readily eaten by stock except when forage is scarce, it is considered questionable if it is ever consumed by sheep and cattle in sufficient quantities to prove poisonous. However, since quantitative chemical analyses of the plant indicate an average HCN content of 0.03 percent, it may be considered a potential source of danger to livestock.

Hydrogen ion concentration and cyanogenesis in sorghum, J. F. Couch and R. R. Briese. (U. S. D. A.). (*Amer. Jour. Pharm., 111 (1939), Nos. 2, pp. 55–64; 4, pp. 151–160; 5, pp. 193–201*).—This contribution is presented with a list of 45 references to the literature.

Scum on pond in Weld County proved lethal, A. W. Deem (*Colo. Farm Bul. [Colorado Sta.], 1 (1939), No. 4, pp. 18, 19*).—Blue-green algae that develop in stagnant water, previously reported as a source of livestock poisoning in various foreign countries and in Minnesota, Michigan, and South Dakota, is here reported for the first time as a source of loss in Colorado. The concentration of algae at one end of a 10-acre pond, whence they were driven by the wind, resulted in the death of a calf, domestic ducks, wild birds, etc., that drank therefrom. In laboratory tests the algae were found to be poisonous to guinea pigs, rabbits, and chickens. From 2 to 5 cc. of the material killed chickens and guinea pigs in from 5 to 10 min., and subsequent autopsies disclosed no evident lesions.

The treatment of babesiellosis (B. argentina) with Acaprin, J. Legg (*Austral. Vet. Jour., 15 (1939), No. 3, pp. 121–123*).—The author found that Acaprin, N,N'-(bismethylquinolylmethyl sulfate-6-) carbamide (Bayer), a synthetic drug now widely used as a specific against piroplasmosis in domestic animals, when applied in doses of 6 cc. subcutaneously to cattle reacting acutely to *Babesia argentina* is followed by a rapid disappearance of the parasites from the peripheral blood and a fall in temperature. Animals so treated rapidly recover.

Dipterous larvae and wound treatment, A. D. Imms (*Lancet [London], 1939, II, No. 12, p. 668*).—Brief reference is made to important contributions on the use of dipterous larvae in wound treatment.

Hematological studies on cattle, II, III (*Philippine Agr., 28 (1939), No. 2, pp. 79–98, fig. 1; 3, pp. 187–205, figs. 4*).—In continuation of this series (E. S. R., 72, p. 839), part 2, by M. Manresa, F. Gomez, and F. O. Santos, deals with variations in hemoglobin in Indian Nellore oxen as affected by atmospheric temperature, relative humidity, body temperature, and certain chemical components of the blood, and part 3, by M. Manresa and P. R. Falcon, with fluctuations in the hemoglobin of Indian Nellore oxen as affected by seasonal variation.

The treatment of actinomycosis by the intravenous administration of sodium iodide, E. M. Pullar (*Austral. Vet. Jour., 15 (1939), No. 3, pp. 104–117, figs. 3*).—The method of treating actinomycosis described by Farquharson (E. S. R., 78, p. 395) was tested on a series of 16 cases of actinomycosis in cattle. "In actinobacillosis of the tongue the lesions completely resolved after one treatment. Satisfactory results were obtained following the treatment of cases of actinobacillosis of tissues other than the tongue and streptothrix infection of hard and soft tissues. As the number of cases treated was small, it is difficult to assess the results accurately. This is being corrected by further tests in a second series of cases. Two cases of staphylococcal actinomycosis of the udder failed to respond to treatment."

Recent observations on the premunization of cattle against tick-fevers in Queensland, J. Legg (*Austral. Vet. Jour., 15 (1939), No. 2, pp. 46–53*).

Tuberculin tests in cattle, J. B. BUXTON and R. E. GLOVER ([*Gt. Brit.*] *Agr. Res. Council Rpt. Ser. No. 4* (*1939*), *pp. V+94, figs. 14*).—This is a report of observations on the intradermal tuberculin test in cattle with special reference to the use of synthetic medium tuberculin.

Vaccination of feedlot lambs is advised to prevent "sore mouth" complications, F. THORP, JR. (*Colo. Farm Bul.* [*Colorado Sta.*], *1* (*1939*), *No. 4, pp. 3, 4*).—Sore mouth, or contagious ecthyma, a disease of lambs which appears during the first week or 10 days after they are received in the feed lot, is caused by a filtrable virus and is in itself not very serious from the viewpoint of death loss. *Actinomyces necrophorus*, a secondary invader in this affection, however, often causes serious complications climaxed by death. When the lesions of the disease are confined to the mouth few losses occur, but when complications from the necrophorus bacterium appear in other parts of the body the malady may become serious and death may occur. Necrotic lesions may appear on the tongue, hard palate, and the larynx, and necrotic ulcers may be present in the paunch, in the other three stomachs, and in the small and large intestines. Small grayish areas may be observed in the liver. If the necrophorus bacterium is aspirated into the lungs a pneumonia develops. The bipolar micro-organism may also be found associated with *A. necrophorus* in the penumonic cases. A protective vaccine prepared from scabs removed from typical cases of sore mouth and applied during the first 2 weeks of the lives of the lambs has been found by the station to be effective as a means of preventing the disease. Observations during the last 3 yr. at the station indicate that lambs may be vaccinated a few days after arrival in the feed lots and the complications that cause such heavy losses thus prevented.

Studies on Listerella infection in sheep, H. E. BIESTER and L. H. SCHWARTE. (Iowa State Col.). (*Jour. Infect. Diseases, 64* (*1939*), *No. 2, pp. 135–144, figs. 8*).—Report is made of a study of the pathology and bacteriology of a disease that appeared in April 1937 in a feeder flock of 2,200 in southern Iowa with a loss of about 255 lambs. Repeated subcutaneous or intramuscular injections of *L. ovis* cultures in sheep and swine produced the same neurotropic infection after about 5 weeks. Swine were more resistant than sheep "to the intracerebral injection of pure cultures of *L. ovis*. Repeated intramuscular injections of large doses of saline suspensions of the organism in swine produced relatively high serum agglutination titers but the animals eventually succumbed, presenting severe changes in the central nervous system. In a limited number of field cases examined there was found a definite increase of monocytes. *Listerella* of ovine origin remained viable for many months in brain tissues stored in sterile 50 percent neutral glycerin at refrigerator temperature."

Further experiments on the incidence and control of pica in sheep in the botulism areas of Western Australia, E. J. UNDERWOOD, A. B. BECK, and F. L. SHIER (*Austral. Jour. Expt. Biol. and Med. Sci., 17* (*1939*), *No. 2, pp. 183–192*).

Is the so-called trembling disease of sheep inoculable? [trans. title], J. CUILLÉ and P. L. CHELLE (*Compt. Rend. Acad. Sci.* [*Paris*], *203* (*1936*), *No. 26, pp. 1552–1554*).—In transmission experiments conducted with two lambs, the authors found the trembling disease of sheep to be infectious, and that the virus occurs in the brain and medulla. The period of incubation following inoculation was 14 and 22 mo., respectively.

Trembling disease of sheep is readily transmitted by inoculation [trans. title], J. CUILLÉ and P. L. CHELLE (*Compt. Rend. Acad. Sci.* [*Paris*], *206* (*1938*), *No. 1, pp. 78, 79*).—The authors' investigations of trembling disease of sheep have further confirmed the earlier studies above noted. They have shown that the

causative virus is directly transmissible by inoculation of infected material from animals suffering with the disease, and that its passage from the second to a third animal may be effected through either subcutaneous, intraocular, epidural, or intracerebral injection of nerve tissue (cord or brain). Ordinarily the incubation period is not shorter than a year and may extend to nearly 2 yr.

Is trembling disease of sheep due to a filtrable virus? [trans. title], J. Cuillé and P. L. Chelle (*Compt. Rend. Acad. Sci. [Paris], 206 (1938), No. 22, pp. 1687, 1688*).—The work here reported has confirmed the earlier finding, above noted, as to the transmissibility and the incubation period of trembling disease of the sheep. It has shown that the causative virus passes the Chamberland L 3 filter and that the filtration does not perceptibly affect the pathogenic action of the virus.

Experimental transmission of trembling disease of the goat [trans. title], J. Cuillé and P. L. Chelle (*Compt. Rend. Acad. Sci. [Paris], 208 (1939), No. 13, pp. 1058–1060*).—In the earlier work above noted sheep 'rembles was shown to be a highly infectious disease, the virus of which passes the Chamberland L 3 filter. Working with this virus it has been shown (1) to be transmissible to the goat through inoculation, (2) to have an incubation period in the goat somewhat longer than in the sheep (25 to 26 mo.), and (3) to take a paralytic form without cutaneous paranesthesia.

The efficiency of copper sulphate and carbon tetrachloride against Haemonchus contortus in adult sheep, H. McL. Gordon (*Austral. Vet. Jour., 15 (1939), No. 3, pp. 118–120*).—The author reports finding the usually prescribed dose of carbon tetrachloride to be effective against mature stomach worms (*H. contortus*) in adult sheep. Copper sulfate solution, in the dose usually prescribed for adult sheep, is not effective, but twice the usual dose, namely, 2 oz. (60 cc.) of a 4 percent copper sulfate solution, was highly efficient.

Nematode parasites of sheep in Western Australia, W. P. Rogers (*Jour. Helminthol., 17 (1939), No. 3, pp. 151–158, fig. 1*).—In an investigation made of parasites of sheep in Western Australia, 18 species of nematodes were found to parasitize this host. "*Trichostrongylus rugatus* and *T. probolurus* were found to be present in this state, and specimens of *Ostertagia mentulata*, a species new to Australian records, were found on two occasions. *Trichostrongylus* spp. and *O. circumcincta* were found to be of chief importance. The seasonal incidence of a number of parasites was found. As a rule, the course of infestations was found to be similar, the highest occurring in late summer and the lowest in midwinter. A seasonal variation in egg output was recorded, more eggs being shed in the winter months. Results indicated that with increases in the numbers of parasites the egg output per female worm decreased."

The fox (Vulpes vulpes L. 1758) as a definitive host of Taenia ovis (Cobbold 1869) Ransom 1913, E. M. Pullar (*Austral. Vet. Jour., 15 (1939), No. 3, pp. 123–125*).—The finding of *V. vulpes* as a definitive host of *T. ovis* is recorded.

A case of black disease in the horse, J. A. Dumaresq (*Austral. Vet. Jour., 15 (1939), No. 2, pp. 53–57, figs. 3*).—Report is made of a case of black disease in a horse, the history and lesions of which closely resembled the typical manifestation of the disease in sheep. *Clostridium oedematiens* was isolated from the liver lesion. There were no signs of fluke infection, but it is thought the liver damage necessary for the development of *C. oedematiens* spores may have been brought about by a wandering strongylid larva.

The influence of hydrogen-ion concentration on the survival of hog-cholera virus in defibrinated blood, R. M. Chapin, W. C. Powick, C. N. McBryde, and C. G. Cole. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc., 95*

(1939), No. 751, pp. 494–496).—In the work presented, in which a description of the experimental procedure is included, a pH value near 5.2 appeared to be sharply optimal for persistence of the infectivity of hog cholera virus in defibrinated hog blood. Obstacles to utilization of the finding in the commercial production of simultaneous virus are indicated. In the presence of 40 percent of urea, the blood at pH 6 retained infectivity for at least 22 days at room temperature and for at least 31 days under refrigeration. The necessity for storing simultaneous virus at a low temperature is emphasized.

A note on the experimental transmission of Cysticercus ovis, H. McL. Gordon (*Austral. Vet. Jour., 15 (1939), No. 3, pp. 125, 126*).—The successful transmission of *Taenia ovis* to a dog by feeding *C. ovis* cysts from a sheep is recorded, as is the subsequent transmission of *C. ovis* to sheep by feeding eggs from the tapeworm recovered from the dog.

Investigations on trichinosis in Canada.—II, A further survey of the incidence of Trichinella spiralis in hogs in eastern Canada, T. W. M. Cameron (*Canad. Jour. Res., 17 (1939), No. 7, Sect. D, pp. 151–153*).—In further work (E. S. R., 80, p. 109) conducted during the years 1937 and 1938, 15 percent of the 2,000 hogs from eastern Canada that were examined for *T. spiralis* cysts were found infected.

Morphology of Babesia canis, D. A. Sanders. (Fla. Expt. Sta.). (*North Amer. Vet., 20 (1939), No. 7, pp. 53, 54*).

Observations on the dog heartworm Dirofilaria immitis, H. W. Brown. (Univ. N. C.). (*North Amer. Vet., 20 (1939), No. 1, pp. 49–54, 55*).—Attention is directed to the frequency of occurrence of this blood parasite of the dog.

Biology, host relationship, and identification of ticks infesting dogs in Florida, H. Hixson. (Univ. Fla.). (*North Amer. Vet., 20 (1939), No. 7, pp. 45–49, 50, figs. 5*).

[Poultry pathology and disease control at the Seventh World's Poultry Congress] (*7. World's Poultry Cong. and Expo., Cleveland, 1939, Proc., pp. 215–303, figs. 9*).—Contributions relating to poultry pathology and disease control (E. S. R., 77, p. 702) are: The Poultry-Disease Situation, by H. J. Stafseth (pp. 215, 216) (Mich. State Col.); The Poultry Health Service [trans. title], by K. F. Beller (pp. 216–218); Importance of Nonspecific Pathological Conditions in Causing Mortality and Culls in Laying Flocks, by J. R. Beach (pp. 219–224) (Calif. Expt. Sta.); Combating Poultry Diseases in the Netherlands, by B. J. C. te Hennepe (pp. 224–227); Infectious Diseases of Fowls in Italy, by C. Bisanti (pp. 227, 228); Important Diseases of Poultry in Egypt and Their Control, by H. S. El-Dine (pp. 229–231); Disease Problems of Long Island Duck Raisers, by K. F. Hilbert (pp. 231–233); Paratyphoid in Ducks in Relation to Public Health, by A. Clarenburg (pp. 233–236); Diseases of Turkeys in the United States—A Review, by W. R. Hinshaw (pp. 236–240) (Univ. Calif.); An Outbreak of *Salmonella enteritidis* Infection in Baby Turkey Poults, by N. Nakamura, Y. Nose, and B. Negishi (pp. 240, 241); Relationship of Diseases Common to Game Birds and Domestic Poultry, by J. E. Shillinger (pp. 241–243) (U. S. D. A.); Fowl Cholera and the Tuberculin Test [trans. title], by R. Manninger (pp. 243–246); Use of the Chicken Embryo in Poultry-Disease Studies, by C. A. Brandly (pp. 246–250) (Univ. Ill.); Newcastle Disease, by N. Dobson (pp. 250–253); The Treatment of Coryza and of Tracheitis of the Fowl With Chlorine Gas [trans. title], by J. Rudolf (pp. 253–255); Respiratory Diseases of Birds, by F. R. Beaudette (pp. 256–258) (N. J. Stas.); Trichomonads as a Cause of Disease in the Fowl [trans. title], by J. Schaaf (pp. 258–261); Aegyptianellosis of Poultry, by J. D. W. A. Coles (pp. 261–265); Factors in the Resistance of Chickens to Parasitic Worms, by J. E. Ackert (pp. 265–267) (Kans. Sta.); The Gapeworm as a Menace to Poul-

try Production, by E. E. Wehr (pp. 267–270) (U. S. D. A.); Some Observations on Intestinal Worms of Polish Poultry, by St. Wadowski (pp. 270, 271); Incidence of *Salmonella* Types in Fowls in the United States, by P. R. Edwards (pp. 271–274) (Ky. Sta.); *Salmonella* Infections of the Fowl and Their Importance in the Epidemiology of *Salmonella* Organisms in Other Animals [trans. title], by M. Lerche (pp. 274–278); Present Status of Pullorum Disease in the United States, by H. Van Roekel (pp. 278–282) (Mass. Sta.); Some Recent Observations on Fowl Paralysis (Neurolymphomatosis), by F. Blakemore and T. Dalling (pp. 282–286); Present Status of Fowl Leukosis (Fowl Paralysis), by E. P. Johnson (pp. 286–288) (Va. Sta.); The Transmissibility of Marek's Fowl Paralysis [trans. title], by K. Fritzsche (pp. 289–291); The Most Important Malnutrition Diseases of Poultry [trans. title], by O. Seifried (pp. 291–294); Fowl Leukosis, by E. L. Stubbs (pp. 295–298); Hemocytoblastosis in the Chicken, by M. W. Emmel (pp. 298–300) (Fla. Sta.); and Investigations of the Transmissibility of Fowl Paralysis [trans. title], by K. Wagener (pp. 301–303).

The occurrence of Heterakis gallinae in poultry and its relation to disease, breed, and to other helminths, D. O. MORGAN and J. E. WILSON (*Jour. Helminthol., 17 (1939), No. 3, pp. 177–182*).

Cecectomy of chicks and its effect upon their growth and infectability with intestinal flagellates, F. L. RICHARDSON. (Univ. Vt. et al.). (*Amer. Jour. Hyg., 30 (1939), No. 2, Sect. C, pp. 69–71*).—Experiments are reported in which the ceca were successfully removed from seven chickens between 8 and 13 days of age. One died 2 weeks after cecectomy, but death was due to the effects of the operation rather than to the loss of a functional organ. "The cecectomized chicks did not become infected with either *Trichomonas* or *Chilomastix* when they were kept in cage with parasitized chicks, or even when they were inoculated with cecal material containing a great many of these flagellates. Usually a few parasites can be found in rectal material of chicks when the protozoa are abundant in the ceca. This would indicate that the cecum is the normal site of infection and that the comparatively few protozoa found in the rectum are on their way out of the body." Since the average weight of the chicks without ceca was slightly greater at 9 weeks than that of the controls, it is indicated that growth takes place as rapidly without ceca as with them. "In this experiment the four birds used as controls were infected with *Trichomonas* and *Chilomastix*. It is possible that these supposedly nonpathogenic forms have some retarding influence on growth, but the difference in weights is not very large."

Studies on the origin and transmission of fowl paralysis (neurolymphomatosis) by blood inoculation, A. J. DURANT and H. C. MCDOUGLE (*Missouri Sta. Res. Bul. 304 (1939), pp. 23, figs. 11*).—It having been shown that 50 percent of the chicks hatched from visibly affected birds showing the eye form of fowl paralysis developed the disease in from 57 to 171 days and that 60 percent of chicks from affected birds developed some form of paralysis in the third generation within from 171 to 337 days, the authors were led to test the infectivity of the blood of chicks hatched from eggs of hens affected with visible clinical symptoms of the disease. The blood from 22 of 42 from eggs hatched from fowls showing visible clinical symptoms of the disease was inoculated into 527 healthy day-old chicks. With the exception of 2 periods the inoculations were made at 10-day periods until 28 inoculations falling into 14 10-day periods were completed and the donors had reached the age of 136 days. Controls to the number of 507 chicks were maintained. The blood was transfused immediately without any treatment. A total of 91 birds developed fowl paraly-

sis in the inoculated group, whereas only 18 developed the disease in the control birds. The results also show that there were 3 periods of age of the donors at which the blood more readily transmitted the disease to the recipients, (1) 20 to 30 days, (2) 50 to 60 days, and (3) 110 to 120 days. These studies indicate that fowl paralysis produced artificially by intravenous inoculation occurred somewhat earlier than natural transmission, twenty-five cases occurring over a period of 4 mo. in the inoculated birds before any case appeared in the control birds. The data are also presented which show that the eye form (both inoculated and control) of fowl paralysis develops much later than other forms. There were no blood changes involved in the fowl paralysis cases. The data also show that leucosis and tumor formations were not involved to any extent in these investigations.

The work is presented with a list of 123 references to the literature.

Infections of Trichomonas foetus in chick embryos and young chicks, M. J. Hogue (*Amer. Jour. Hyg., 30 (1939), No. 2, Sect. C, pp. 65–67*).—In the experiments reported chick embryos were inoculated with *T. foetus* through the chorioallantois. Later it was recovered from the digestive tract, gall bladder, and yolk sac of the older embryos. Four embryos inoculated with *T. foetus* have hatched as normal chicks. One was positive for *T. foetus;* three were negative. *T. foetus* lived in the eggs from 6 to 7 days after the embryos had died. Unsuccessful attempts were made to infect young chickens with *T. foetus.*

Pullorum disease in turkeys, G. Kernohan (*Nulaid News, 17 (1939), No. 6, pp. 8, 9, 15, figs. 2*).—This disease is discussed.

Swine erysipelas in turkeys, F. R. Beaudette (*New Jersey Stas. Hints to Poultrymen, 26 (1939), No. 4, pp. 4*).—A brief account is given of this disease of swine which first appeared in and killed nearly one-half of a flock of 500 turkeys in November 1935, as reported by the author and C. B. Hudson (E. S. R., 75, p. 260).

Erysipelothrix infection in a quail, E. F. Waller. (Iowa State Col.). (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. 751, pp. 512, 513*).—The author reports upon the case of a 10-week-old quail received from a nearby game farm, from the heart blood of which an organism was isolated that was agglutinated by serum from a rabbit immunized against a known culture of *E. rhusiopathiae.* It was also agglutinated by commercial swine-erysipelas-immune serum and by serum from a pig infected with chronic arthritis and obtained from a herd known to have been infected with swine erysipelas. The cultural reactions of this organism corresponded to the findings for *E. rhusiopathiae.* It is pointed out that the finding in a game bird of an infectious disease that is capable of establishing itself in man as well as in domestic animals might have a far-reaching significance.

On the larval migration of Syngamus trachea and its causal relationship to pneumonia in young birds, P. A. Clapham (*Jour. Helminthol., 17 (1939), No. 3, pp. 159–162*).—The author found that the larvae of the gapeworm *S. trachea* pass from the intestine to the lungs of the definitive host by way of the blood stream, having been recovered from blood taken from the auricles of the heart and from the posterior vena cava. A description is given of the condition of the heavily infected lungs. A condition of "syngamus pneumonia" has been found to occur in wild state among poults of partridges and pheasants. The parasite is a bloodsucker throughout its life, and must be recognized as of pathogenic importance in both larval and adult stages.

AGRICULTURAL ENGINEERING

[Agricultural engineering studies of the Arizona Station] (*Arizona Sta. Rpt. 1938, pp. 18–26, figs. 3*).—Ground-water studies in the Cortaro-Marana district and the Eloy pumping district, the validity of water-table measurements in the determination of unwatering, and wells in the Little Chino Valley and Skull Valley are reported upon, together with adaptation of a deep-well current meter of the propeller type for irrigation wells, pumping plant efficiencies, the duty of water for cotton, the relation of physiography to ground-water supplies, and the utilization of tamarisk wood for fence posts and in furniture.

[Agricultural engineering investigations by the New Jersey Stations] (*New Jersey Stas. Rpt. 1938, pp. 18, 19, 105–109*).—This work has included studies of poultry housing insulation and of silo pressures exerted by molasses hay silage (coop. U. S. D. A.), and, under the general head of water and sewage research, activated sludge, chemical coagulation, biochemical changes in stored sludge, disinfectants, methane-producing and clarifying organisms, growth-promoting substances, and stream pollution.

Daily river stages at river gage stations on the principal rivers of the United States, M. BERNARD (*U. S. Dept. Agr., Weather Bur., Daily River Stages, 35 (1937), pp. III+168*).—This is the usual annual volume (E. S. R., 80, p. 830) continuing the record through 1937.

Supplemental irrigation in Missouri, R. P. BEASLEY (*Missouri Sta. Bul. 410 (1939), pp. 15, fig. 1*).—Irrigation in Missouri has thus far been limited, for the most part, to drought years, overhead spray having been most used by truck gardeners, although portable rotary sprinklers have been gaining popularity. The portable rotary sprinkler calls for much less initial outlay but requires more labor in use. A surface irrigation system involves much less initial cost than either type of spray equipment, but it demands more water, distributes it less evenly, is unsatisfactory on sloping land, and has a greater soil-packing tendency than spray systems. Surface irrigation is considered especially adapted to sandy loam soils bordering streams, however. Cultivating the heavier soils as soon as possible after surface irrigation was found largely to counteract their packing tendency and to improve aeration.

Most vegetable and truck growers interviewed believed irrigation had proven a definite asset, enabling them to market their crops earlier, to keep them growing throughout the growing season, and to produce a crop of superior quality. Most of the farmers who had irrigated corn thought the practice profitable in dry years, if the investment were not too costly. Certain of these farmers felt that under these circumstances irrigation of corn would be profitable in any season.

In corn irrigation, the crop may be seriously damaged before water is applied. Preparation for irrigation should be made soon after the corn comes up.

Low-pressure sprinkler irrigation, F. W. DUFFEE. (Wis. Expt. Sta.). (*Agr. Engin., 20 (1939), No. 3, pp. 97, 98, figs. 3*).—Low-pressure sprinkler irrigation equipment developed at the station is described. It has been found that the cost of equipment per acre for the standard type of rotary sprinkler irrigation usually decreases rather rapidly up to about 50 acres, and may be as low as $25 or $30 per acre on larger areas, provided the water supply is close to the field.

A pressure of 20 lb. was arrived at as representing the lowest pressure that could be used and insure reasonably uniform pressure at all sprinklers. Operating at about half the pressure of the standard system reduces the power requirement about half. Reducing the width of the strip irrigated from 80 to 40 ft. reduces the amount of water pumped per minute by 50 percent, and this

again cuts the power required by 50 percent, which means that approximately one-fourth as much power is needed for a line of a given length as compared to the standard system. The reduced capacity permits using 2- or 3-in. tubing, which further reduces the cost.

The No. 1 line, 100 ft. long, will cover 4 acres with 1 in. of water per week, operating 14 hr. per day; No. 2 will cover 8 acres; and No. 3, 12 acres. Thus a small, inexpensive system operating nearly continuously does the same work as a standard system operating only part of the time.

The development and use of the bone filter for removing fluorine from drinking water, H. V. SMITH and W. B. DAVEY (*Arizona Sta. Tech. Bul. 81* (*1939*), *pp. 247–292, figs. 13*).—Bone was rendered effective for removing fluorine compounds from water by boiling with alkali until the material lost its flinty characteristics and became white, washing out the excess alkali with water, and neutralizing with a dilute hydrochloric acid treatment. After use the bone could be regenerated for further use by an overnight treatment with cold alkali (0.25 N) followed by a 10-min. wash with dilute acetic or hydrochloric acid (0.1 N). It was found that calcination of the bone at from 400° to 600° C. for 10 min. followed by a 10-min. acid treatment yields a better bone product for the fluoride-removal process, and that bone prepared in this manner will not putrefy as do some of the alkali-acid activated products.

The finer fractions removed the greater quantity of fluorine. A 40–60 mesh was found most desirable. The absorbent removed more of the fluorine compounds as the time of contact of the absorbent with the water to be treated was increased. The pH value, between 3 and 8, had little effect upon the absorption. Temperature was also found to have no influence on the fluoride-removing effectiveness. The presence of salts other than fluorine compounds had little effect, though tending in some instances to decrease the quantity of fluorine taken up. Dividing a given quantity of the bone into two treatments gave no better results than using it all in a single treatment. No other phosphate preparation was found as effective as that prepared from bone. Both olla and pressure filters were found to be practicable.

The mechanism by which bone removes fluorine from water appears to be that of the formation of solid solutions rather than that of simple anion exchange.

A study of hydrolytic enzymes in activated sludge, R. S. INGOLS (*New Jersey Stas. Bul. 669* (*1939*), *pp. 32, figs. 4*).—There was found to be a marked increase in pepsin during the development of activated sludge from sewage. Lipase, diastase, and trypsin increase slightly. Lipase, pepsin, and diastase were found only on the surface of the sludge floc, but trypsin was found also in the liquor surrounding the floc. The enzyme activities of a mixture of activated sludge and sewage changed little during a 6-hr. aeration period. Slight fluctuations in pH had little effect upon the enzymes studied. When activated sludge was aerated continuously for several weeks, the enzymes increased during the first 3 days, then decreased gradually. The diastase of the sludge organisms could be increased 500 percent by feeding the sludge organisms starch at 5° C. The diastase reacted better at a concentration of salts slightly higher than that found in the activated sludge liquors studied. Plasmolysis of the sludge organisms led to an increase in the free enzymes. Clarification of the sewage was found to be correlated with the biophysical properties of the activated sludge floc; purification with the enzyme activity.

Measurement of soil hardness, A. A. STONE and I. L. WILLIAMS (*Agr. Engin.*, *20* (*1939*), *No. 1, pp. 25, 26, fig. 1*).—A soil-hardness gage used in the testing of garden tractors is described. The instrument consists of a cylindrical tube

or barrel 55 in. in height and 1½ in. in diameter. This barrel is mounted on a 10-inch. square plate of $^{3}/_{16}$-in. steel. The penetrator is a piece of round steel 24 in. long, 1⅛ in. in diameter at the top and tapered to ¼ in. diameter at the tip or lower end, which is rounded. It is divided into 1- and ¼-in. graduations. At the lower end narrow slots extend upward from the base on opposite sides of the barrel. A retainer is mounted at the upper end of the barrel with a pin for suspending the penetrator at a fixed height of 36 in. above ground level. The retaining pin is withdrawn manually by the operator when he wishes to drop the penetrator. The point of the penetrator is hardened to prevent deformation by wear. A long penetrator is needed to make evident slight differences in hardness. Test results with several soils are presented to illustrate the scope of use of the gage.

The dynamic properties of soil.—VIII, The effect of certain experimental plow shapes and materials on scouring in heavy clay soils, F. A. KUMMER (Ala. Expt. Sta.). (*Agr. Engin., 20 (1939), No. 3, pp. 111–114, figs. 9*).—Results of field and laboratory experiments showing the effect of certain experimental plow shapes and materials on scouring in heavy clays are reported in continuation of this series (E. S. R., 79, p. 253). The equipment and methods used included alloy-steel moldboard coverings, endless belt-type moldboards, wooden rollers replacing solid moldboards, and wooden slats impregnated with paraffin or linseed oil, replacing steel slats. The results obtained with impregnated wooden slats coincide with results from similar experiments conducted on Texas soils where plaster of paris and hoghide coverings for moldboards were used. Plowing tests showed that wood-slat bottoms produced considerably better scouring than steel-slat bottoms, especially in the higher moisture ranges.

Test results of metallic zinc paint on galvanized sheet metal, G. C. BARTELLS (*Agr. Engin., 20 (1939), No. 3, pp. 101–103, figs. 8*).—A summary of tests conducted over a period of 6 yr. by the American Zinc Institute indicates that metallic zinc powder paints of the standard 80–20 pigment (80 percent zinc powder and 20 percent zinc oxide, with no inerts) and with various vehicles have given excellent service in one-coat applications under present test conditions. The test periods for these cases have extended up to 4 yr. The test bases were rusty or partly rusty galvanized sheets. When the proportion of zinc powder in the paint is materially less than 80 percent the service is less satisfactory, in some cases only 2 yr. elapsing before failure occurs. Metallic zinc paint when colored red by the addition of iron oxide gives satisfactory results in excess of 2 yr., but when changed to a black color by the addition of carbon black, the service results are not satisfactory as pinholes of rust appear in the second year. Apparently there is some interaction between pigments. Asphalt paints used in one-coat applications have not shown good service results, pinholes starting in the second year with almost complete failure in 3 yr. The admixture of asbestos fiber improved the results. The use of ordinary red oxide of iron as a pigment has not proved satisfactory with any vehicle. On galvanized sheets that had begun to rust, incipient failure (pinholes of rust) became plainly evident during the second year of exposure. Fish oil when used as a vehicle with zinc powder paints of standard 80–20 pigment composition has so far (in 2 yr. of test) shown generally good results, but with certain proprietary paints of low pigment weight the service is unsatisfactory. Soybean oil when used as a vehicle for zinc powder paints of standard 80–20 proportion in 30–60–100 percent replacements of linseed oil has given good service through the 3 yr. this particular test has progressed. When used in certain proprietary paints of low pigment content or low-quality pigment it has shown unsatisfactory results, pinholes of rust being in evidence

in less than 1 year's time. Certain commercial varnishes when used as vehicles for 80–20 zinc powder paints do not give as satisfactory service results in rural exposure as does linseed oil. Zinc powder paints flow from the brush, spread more easily, possess higher hiding power with one coat, and show less of brush or lap marks than any of the other paints tested.

The original tests, started on the north roof of a granary in 1934, have demonstrated that of all the paints used there, metallic zinc paint of 80–20 formulation, with no inerts, gives better protection in one- or two-coat applications than any of the other paints used. In fact, the metallic zinc paint films are the only ones left intact there after more than 4 yr. Certain tests of over 3 years' duration, and some of less, show definitely that metallic zinc paint with linseed or soybean oil is well adapted to the painting of new, untreated, zinc-coated surfaces. The tests are not comprehensive enough to justify an unqualified recommendation in this respect, but in all cases under observation or actual test the uniformly excellent tight and permanent adherence of metallic zinc paint to such new zinc-coated surfaces indicates a general dependability of the paint for this particular use. All our tests have demonstrated that on sheets where base metal rust is present, one coat of paint does not give adequate proportional protection. Such rusty sheets should, for best results, receive two coats to effectually cover and protect the rough surface of the base metal rust.

Paints should be applied to metal surfaces preferably when the air temperature is 60° F. or above; otherwise the condensed moisture film likely to form on cold metal will not only be injurious to the paint film but will greatly reduce the spreading rate of the paint.

The performance of large-scale field operations indicates that metallic zinc paint of standard 80–20 pigment and linseed oil vehicle can be expected to give at least 7 yr. of satisfactory service in one-coat applications in rural exposures and upwards of 10 yr. of such service with two coats under severe industrial exposure.

Economical power sprayer, T. E. ASHLEY (*Miss. Farm Res.* [*Mississippi Sta.*], 2 *(1939), No. 9, p. 7, fig. 1*).—The author describes a barrel sprayer operated by an ordinary well-pump-jack having a 16:1 ratio, the power being provided by a 0.5-hp. gasoline engine capable of operating for 10 hr. on 0.5 gal. of gasoline and using 1 pt. of oil in from 20 to 30 hr. of operation. An extra air chamber, found to be necessary for the maintenance of an even and constant pressure of 125 lb., was provided in the form of a 2-ft. length of 6-in. pipe, capped at each end, fitted with the necessary connections, and attached to the inside of the head of the barrel. A relief valve was added to the pump. The total cost, of which an itemized account is given, was found to be from $60 to $65, exclusive of labor. A sketch shows the general construction, motor, pump, and barrel being mounted on skids. The device is intended to be loaded on a truck or wagon.

Labor efficiency and power economy in corn production, J. B. DAVIDSON. (Iowa Expt. Sta.). (*Agr. Engin., 20 (1939), No. 5, pp. 183–186, figs. 2*).—A review is presented of the procedure and results obtained by the station in studies of the engineering aspects of corn production.

It has been found that power required for plowing is 41 percent of the total power required for the production of a corn crop. Planting requires little power but much skill. It can be combined with other operations. A four-row planter and cultivator combination used in the tests reported required 0.77 man-hr. and 2.3 hp.-hr. per acre.

In 5 yr. of experimentation at the station through the use of pneumatic tires on tractors and wagons, permitting larger loads to be hauled at a higher speed,

the use of extensible tongues for quick hitching, larger wagons up to 100-bu. capacity, and the use of a pit elevator which does not require the operator to wait for the ear corn to be slowly fed to the elevator, the labor for harvesting has been reduced from 2.5 to 0.91 hr. per acre.

Natural drying of forage crops, T. N. Jones. (Miss. Expt. Sta.). (*Agr. Engin., 20 (1939), No. 3, pp. 115, 116, figs. 2*).—Studies at the station indicated that windrowing alfalfa hay aids a continuation of the natural physiological process of transpiration, resulting in a greater moisture loss for a day's period. Double windrowing 2 hr. after cutting gives hay with a better color, a larger percentage of leaves, and a lower moisture content at the end of the day. Data indicated that the leaves of alfalfa plants aid greatly in lowering the moisture content of the entire plant. Photomicrographs showed a reopening of the stomata following windrowing 2 hr. after cut. The process of crushing large-stemmed hays, such as Johnson grass and soybeans, will permit a needed change in methods and will reduce the time required in curing.

Low-cost hay drying, J. W. Weaver, Jr., and C. E. Wylie. (Tenn. Expt. Sta. et al.). (*Agr. Engin., 20 (1939), No. 1, pp. 13, 14, 16, figs. 6*).—In experiments on low-cost hay drying the Tennessee Valley Authority has developed a system of barn drying which consists of wooden ducts constructed on the floor of a hay mow, over which hay, partially dried in the field, is stored. This duct system is connected to an electrically driven blower located in a small room on the side of the barn or on the ground floor within the barn.

To warm the air blown through the hay in this system a solar heat absorber has been developed for placement on the barn roof. It is constructed of 28-gage galvanized sheet steel. It was found that by drawing atmospheric air under this absorber prior to forcing it through the hay the air temperature could be increased from 10° to 22° F., with a resultant decrease in relative humidity of about 1.5 percent for each degree rise in temperature.

Tests comparing this system of drying with field drying showed that the barn-drying system can adequately complete the drying of hay of 45-percent moisture. With favorable weather conditions, 31 hr. are required to completely dry alfalfa hay in the field, but only 4 hr. of field drying are needed to dry the hay to a point where it may be stored on the barn drier where drying is completed in 4 days to 2 weeks. After the first cutting or layer of hay has been dried the second cutting is stored upon the first and the first cutting upon the second. Observations show that the maximum height to which hay may be stored on the barn drier is about 10 ft. after settling. No more than 6 ft. of hay should be stored on this drier at one cutting. Samples of the hay analyzed by the hay, feed, and seed division of the U. S. D. A. Bureau of Agricultural Economics show barn-dried hay to average 2.3 percent more leaves, 19 percent more green color, and a quality of about one grade and class better than field-dried hay cut from the same field at the same time.

An internal-combustion nut cracker, R. Bainer and C. E. Barbee. (Calif. Expt. Sta.). (*Agr. Engin., 20 (1939), No. 1, pp. 21, 22, figs. 5*).—An internal-combustion machine has been developed at the station for cracking English walnuts which punctures the nutshell, introduces an explosive gas mixture through the hole to fill the space between the shell and the nut kernel, and then explodes the gas to shatter and separate the shell from the kernel. Approximately 60 percent of the nut meats come out in whole or half pieces, while the balance are in rather large pieces. Allowing 2 in. per nut, this machine has a potential capacity of approximately 900 lb. of unshelled walnuts per hour.

Some requirements of farm electric milk coolers, J. E. Nicholas. (Pa. State Col.). (*Pa. Assoc. Dairy Sanit. Ann. Rpt., 14 (1938), pp. 38–46, figs. 8*).—

In addition to a general discussion of the topic, data are presented on the effect of expanding to the top or bottom of the cooling coil on the temperature of the water in a cooling tank and on the relative rates at which milk in 10-gal. cans was cooled with and without agitation of the cooling medium.

Costs and values in rural housing, D. G. CARTER. (Ark. Expt. Sta.). (*Agr. Engin., 20 (1939), No. 5, pp. 199, 200, figs. 2*).—An investigation by the station of housing conditions, needs, and incomes indicated that Arkansas homes could be improved in quality only by the substitution of other values in lieu of cash. A study was made of 214 houses built with a contribution of home labor and material resources to reduce the cost. Although considerable variation occurred in individual cases, the averages, medians, group distributions, and cost data are comparable to other research data obtained. The average cash expenditure per house was $740 (on 190 records, $700), annual income per farm $785, average value of contributed labor and material $875, and calculated total value per house $1,575. Principal noncash contributions consisted of home labor valued at $344 and native materials valued at $531 per house. The conservation of cash resources enabled the owners to obtain much higher quality housing than the average of the white owners of the State. The annual income of the farm is a major factor in quality of housing. At the higher income levels more equipment was installed, houses were larger, a greater cash expenditure was made, and less home labor was used. The average unit values of the houses studied were 11.1 ct. per cubic foot, $1.64 per square foot, and $332 per room. The cash cost was 44.4 percent of the total value, and the home contribution was 55.6 percent.

Designing farm buildings for wind resistance, H. GIESE. (Iowa Expt. Sta.). (*Agr. Engin., 20 (1939), No. 3, pp. 99, 100, 103, figs. 5*).—A study by the station of wind damage to Iowa farm buildings indicates that structural improvement to make them highly wind resistant is feasible and can be easily accomplished. Little if any more material than is now being used is necessary. The difference in rigidity between the barn and house is sufficient to make the latter practically immune, while the former represents the greatest farm loss.

High-leakage transformers as alternating current fence controllers, H. W. RILEY and S. KRASIK. ([N. Y.] Cornell Sta.). (*Agr. Engin., 20 (1939), No. 1, pp. 7–10, 12, figs. 8*).—This technical discussion by the station indicates that the optimum performance of a high-leakage transformer fence controller is realized at resonance, as far as uniformity of control in dry and wet weather is concerned.

AGRICULTURAL ECONOMICS

[Papers on agricultural economics] (*Assoc. South. Agr. Workers Proc., 40 (1939), pp. 40–45, 48–52, 111, 112, 114–117, 123, 125, 126, 153–161*).—Included are abstracts of papers presented at the fortieth annual convention of the Association of Southern Agricultural Workers held at New Orleans, La., February 1–3, 1938, as follows: Marketing, horticulture, and commissioners of agriculture—Louisiana Methods (Storing Sweet Potatoes), by W. D. Kimbrough (La. Expt. Sta.), Louisiana Methods (Grading, Packing, and Loading Sweet Potatoes), by H. S. Moles, Louisiana Methods (The Marketing of Sweet Potatoes), by R. A. Ballinger (La. Sta.), The Handling of Perishables by Merchant Truck Buyers—Florida's Experience, by D. E. Timmons, and Modern Trends in Marketing Perishable Food Products, by S. B. Shaw; agricultural economics and rural sociology section—Larger Farm Incomes in the Southern Region, by B. M. Gile (La. State Univ.), The Farm Leasing System of Texas, by C. H. Hamilton (Tex. Sta.), Current Farm Management Research in Relation to the Food and

Feed Requirements of the South, by B. H. Thibodeaux (U. S. D. A.), and Contents of a Good Farm Lease for the South, by D. P. Trent; Farm Security Administration section—The Tenant Purchase Program as a Real Demonstration of Complete Rehabilitation, by W. J. Green, Methods of Purchasing Capital Goods for Rural Rehabilitation and Project Families to Secure the Best Quality at Minimum Price, by M. J. Haile, Scope and Effectiveness of Simple Service Co-operative Loans, by M. E. Tisdale, Co-operative Farming as a Means of Increasing Efficiency in Production, by E. B. Whitaker, and Probable Work Program to Supplement the Income of Certain Types of Low-Income Farmers, by F. H. Drayer; and marketing section—Basic Principles of Farmers' Wholesale Produce Markets, by W. C. Ockey (U. S. D. A.), The Marketing of Perishable Products Through Auctions, by K. B. Garnder, Farmers' Produce Auction in Florida, by S. W. Hiatt and F. W. Risher, Louisiana Strawberry Auctions, by M. J. Voorhies, Fruit and Vegetable Auction Markets in Producing Areas, by G. E. Prince, Cotton Classification Under the Smith-Doxey Act, by R. A. Ballinger (La. State Univ.), and Faults, Advantages, and Possibilities of Services Authorized by the Smith-Doxey Act, by C. H. Robinson, and Foreign Versus American Cotton Marketing Methods, by P. K. Norris (both U. S. D. A.).

[Investigations in agricultural economics by the New Hampshire Station, 1938] (*New Hampshire Sta. Bul. 313 (1939), pp. 5, 6, 7, 8*).—In addition to studies previously noted (E. S. R., 79, p. 549), brief findings as to land utilization in Grafton County, by H. C. Woodworth, and marketing and prices of blueberries, strawberries, raspberries, and blackberries, by L. A. Dougherty, are included.

Current Farm Economics, [August 1939] (*Oklahoma Sta., Cur. Farm Econ., 12 (1939), No. 4, pp. 95–118, figs. 6*).—In addition to the usual tables of indexes of prices, demand deposits, and purchasing power of different Oklahoma products and the discussion of the agricultural situation by the staff of the department of agricultural economics, short articles are included as follows: *Oklahoma's Sheep Industry, by M. Hill (pp. 101–106)*, with table, map, and charts showing the cash farm income from sheep and lambs by years 1924–38, number of sheep and lambs by counties, January 1, 1935, total number of sheep on farms by years January 1, 1910–39, inclusive, and the indexes of farm price of lambs and of all commodities; Some Facts About Small Farms in Oklahoma, by P. Nelson (pp. 106–111), with tables showing number of farms of different size in the State 1930 and 1935, crop and livestock organization, the average farm returns on 76 farms in 1935 and 59 farms in 1937 in Muskogee County, and the average farm returns on farms in 1935 classified by size; and The Why and How of Index Numbers, by M. Hill (pp. 111–116), which describes the method of computing the index numbers of prices and products used by the station, and use of such index numbers.

The regional approach to the conservation of natural resources (*Wis. Univ. Bul., Gen. Ser., No. 2125 (1938), pp. 27, figs. 3*).—The problem of regionalism in relation to the conservation of natural resources and the future of the regional attack on conservation problems are discussed. The relations of the University of Wisconsin to regional investigation and development in the State and to national investigations and accomplishments are described.

Land conservation and social planning, S. von Ciriacy-Wantrup (*Plan Age, 5 (1939), No. 4, pp. 109–119*).—This is a revision and enlargement of the author's article on Economic Aspects of Land Conservation (E. S. R., 80, p. 119), which discusses land conservation and the problem of futurity in private and social economics.

The relationship between soil-maintenance and profitable farming, F. L. Morison and J. I. Falconer. (Coop. U. S. D. A.). (*Ohio Sta. Bul. 604 (1939)*,

pp. 32, figs. 2).—This study was made to determine the percentage of Ohio farmers using farming practices that would maintain soil productivity, and the relationship between the practices and income. It is based on detailed farm management records for the year ended June 30, 1936, for all farms in solid blocks of land totaling 10,000 acres each in Ashtabula, Wyandot, Wood, and Pike Counties, and also on similar studies of representative farms on different soil types in Hancock, Miami, Portage, Licking, Brown, and Belmont Counties.

Fifteen percent of the 696 farms included in the studies were found to be in balance, i. e., had a zero or plus soil productivity balance. The percentage of rotated cropland in soil-depleting crops was less and that in soil-conserving crops greater than the averages on the farms in balance. The relative amount of alfalfa and clovers, compared with timothy, and amount of manure produced per unit were higher. The larger farms and the farms operated by owners and tenants related to the owners usually had the better balances. Crop yields were better, the amount of livestock greater, and more hay was fed per roughage-consuming animal unit on the farms that were in balance. Labor income per farm and per 100 rotated acres increased as the productivity balance approached and exceeded zero. The farms out of balance sold more of the corn and other feed grains produced. The farmers who maintained the productivity of their soil had less land in corn, but due to better yields produced nearly as much corn as those with the highest annual rate of soil depletion. The calculation of ways of bringing the out-of-balance farms into balance emphasized particularly the importance of high quality hay. An increase in the amounts of hay and rotation pasture does not necessarily require a corresponding increase in the number of roughage-consuming livestock. Inadequate buildings, small size of businesses, lack of capital, tenancy problems, and age of farm operators were found to be obstacles in the way of making desirable shifts to improve the productivity balance.

Farming conditions in Toombs County, Georgia, J. C. Elrod and O. Steanson. (Coop. U. S. D. A.). (*Georgia Sta. Bul. 202 (1939), pp. 42, figs. 2*).—This study is based chiefly on farm organization and practice data for 1935 obtained in field surveys, including 139 farms, on a special survey of the Soil Conservation Service of 78 farms, on work sheets filed with the Agricultural Adjustment Administration by farmers planning to participate in the 1936 agricultural conservation program, and on reports of the U. S. Bureau of the Census. The soil, surface, and erosion conditions, recent agricultural development, land use, tenure and color of farm operators, size of farm and farm organization, crop yields, cropping system, and cropping and livestock practices in the county are discussed. The farms are divided into two size groups—family farms having 29 acres or less of cropland, and large farms having 30 acres or more of cropland, with further subdivisions based on the proportions of the land in cotton and tobacco and the yields of cotton. Analyses are made as to crops, yields, gross income, expenses, farm income, return on investment, etc.

Size of farm had only a slight relationship to the important factors that characterize types of farming. Cropland averaged 45 percent of the farm area of family farms, and 50 percent for the farms of 30 to 59 acres, 58 percent for those of 60 to 89 acres, and 40 percent for those of 90 acres or more. Cotton occupied about the same proportion of the cropland in all groups (23.9 to 26.2 acres), tobacco from 2.4 percent on the largest to 3.9 on the smallest farms, and corn from 55.1 to 57.2 percent in the different groups. On the family farms the returns on investment—farm income (includes $350 for products used on the farm) less value of labor and management of operator—was $280 for tobacco farms, increased from —$47 for cotton farms with low yields to $14 for those with high yields, and from $119 on combination farms with a medium cotton-

to-tobacco ratio to $186 for those with a high ratio. On the large farms the returns per 100 acres on investment were $464 on tobacco farms. On cotton farms it varied from −$47 on farms with a high proportion of cropland in cotton with low yields to $129 for those with a small proportion in cotton and high yields. On the combination farms it increased from $217 for farms with low tobacco-to-cotton acreage ratio and low yields to $531 for those with a high ratio and a medium cotton yield. On the family farms the acreages in 1935 had been reduced from those of the base period for the adjustment programs by 42 percent on cotton farms with low yields, 37 percent on those with medium yields, and 40 percent on those with large yields, 19 percent on tobacco farms and 44 percent for cotton, and 30 percent for tobacco on combination farms with a medium tobacco-to-cotton acreage ratio and 38 percent and 9 percent, respectively, on those with a high ratio. On the large farms on the cotton-type farms, the reductions in acreage from the base period were 49 percent on farms of low, 45 percent on those of medium, and 52 percent on those with high cotton yields. The reduction on tobacco farms was 16 percent. On the combination cotton-and-tobacco farms the reduction in cotton acreage varied from 42 percent on farms with a low cotton-tobacco acreage ratio and high yields of cotton to 53 percent on those with a high ratio and low cotton yields. The reduction in tobacco acreage varied from 4 percent on farms with a medium tobacco-cotton acreage ratio and medium cotton yields to 30 percent on those with a medium ratio and low yields.

Types of farming in West Virginia, W. W. Armentrout and T. D. Johnson. (Coop. U. S. D. A.). (*West Virginia Sta. Bul. 292 (1939), pp. 77+[1], figs. 15*).—The development of agriculture, the physical and economic factors affecting it, and the types of farming in the State are discussed. The State is divided into 12 type-of-farming areas, based primarily on dominant type of farm in respect to source of income, and the land use, crops, livestock, sources of income, and types of farm in each area are described on the basis of the land-class maps previously noted (E. S. R., 78, p. 707).

Type of farming and ranching areas in New Mexico, I, B. Hunter, P. W. Cockerill, and H. B. Pingrey. (Coop. U. S. D. A.). (*New Mexico Sta. Bul. 261 (1939), pp. 68, pls. 4, figs. 27*).—This bulletin describes and discusses the historical background and geographical distribution of agriculture in the State, the physical, biological, and economic factors influencing the development of crops and livestock, and the major agricultural and adjustment problems. A table shows the designations for and characteristics of 25 type-of-farming areas and 33 subareas, for which detailed descriptions are to be included in part 2.

The economic relationship between ranch and range in Nevada (*Nevada Sta. Rpt. 1938, pp. 39–43, fig. 1*).—Brief findings and conclusions are given regarding the importance of maintaining a stable relationship between use of public grazing ranges and privately owned ranch lands.

Economic conditions and problems of agriculture in the Yakima Valley, Washington: The agriculture and its setting, E. B. Hurd and H. F. Hollands. (Coop. U. S. D. A.). (*Washington Sta. Bul. 377 (1939), pp. 82, figs. 12*).—This is the first of a series of bulletins on a study of the Yakima Valley made to assist farmers in formulating plans to increase their economic returns on a permanent basis. The area dealt with is confined to Yakima and Benton Counties, and the bulletin is concerned primarily with the irrigated portions. The physical environment, major land uses, ownership of land, and irrigation and drainage in the area are described. The different crops and livestock enterprises are discussed as to importance, distribution, peculiarities from a farm management point of view, and outlook for contraction or expansion.

Economic problems of the San Carlos irrigation and drainage district (*Arizona Sta. Rpt. 1938, pp. 14, 15*).—Brief findings are included as to net returns, funds available for retirement of construction costs, and use of land, and tenancy and tax delinquency in 1937.

Economics of sugar beet production in Colorado, R. T. Burdick (*Colorado Sta. Bul. 453 (1939), pp. 58, figs. 25*).—This bulletin is based chiefly on previous studies of the station, the U. S. Tariff Commission, and other agencies, and a study of the reports of five sugar companies operating in Colorado for the years 1922–36. The study was made from the viewpoint of the industry as a whole. A brief history of the industry in the State is given, and the costs of producing beets and the earnings of producers, the income, investments, expenses, etc., of the sugar companies, and the friction points in the industry—contract labor, share rent, Federal supervision, and the relations of the sugar companies and the farmers, are discussed and recommendations made for promoting harmony in the industry.

[**Fields and costs of production of apples in New Jersey**] (*New Jersey Stas. Rpt. 1938, p. 14*).—Some findings in Cumberland, Gloucester, Monmouth, and Burlington Counties are included.

Lamb, cattle feeding records show profits, R. T. Burdick (*Colo. Farm Bul. [Colorado Sta.], 1 (1939), No. 4, pp. 13, 14*).—Data are given as to the average net returns per head 1914–22 and 1923–39 for lambs and 1910–20 and 1923–39 for cattle. Data are also included on costs and returns in feeding lambs and cattle during the 1938–39 season.

Large-scale organization in the dairy industry, R. K. Froker, A. W. Colebank, and A. C. Hoffman (*U. S. Dept. Agr. Cir. 527 (1939), pp. 68, figs. 9*).—This circular is devoted primarily to a description and discussion of the character of large-scale developments in the dairy industry of the United States and the effect on marketing structure and handling methods. Sections deal with the growth of large-scale dairy organizations, the financial tendencies of the leading companies, large-scale organization and plant ownership in Wisconsin, and mass distribution of products. Some information is also included on large-scale dairy farming, unionization of labor in the industry, patent control, and mass distribution and cooperative marketing. Comments are also made on some questions of public policy arising from the large-scale developments in the dairy industry.

Product-costs of milk to dealers in the Springfield area, 1935, A. A. Brown and J. E. Donley (*Massachusetts Sta. Bul. 365 (1939), pp. 28, figs. 6*).—The variations in product-costs (weighted average cost to dealers of milk purchased from producers) in the area are analyzed and suggestions made for reducing them. The study is summarized as follows: "The milk industry can perform its most effective service under conditions of relative market stability. Conditions in various Massachusetts secondary areas are not conducive to market orderliness. Among these conditions are uneven distribution of fluid outlets among dealers, rigidities in producer-distributor relationships, and the absence of reasonable relationships between the price payable for milk disposed of as fluid and as surplus. So long as the advantages accruing to distributors as a result of superior personal contact are fully returned to their producers and so long as they are maintained by fair methods, these advantages should not be arbitrarily diminished. The disadvantages suffered by all producers, but mostly by producers with inferior sales' outlets, should be minimized by the development and application of a logical pricing technic based on "normal" class-price relationships."

Foreign Agriculture, [September 1939] (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Foreign Agr., 3 (1939), No. 9, pp. 373–428, figs. 5*).—Articles are included

on Production of Cotton in Latin America, by C. H. Barber (pp. 375-392), and The Market for American Tobacco in Switzerland, by P. G. Minneman (pp. 393-426). Recent developments in foreign agricultural policy are noted in items entitled Ontario regulates marketing of farm products and Spanish Government controls wool prices and sales.

Agriculture in China, F. J. Rossiter *(U. S. Dept. Agr., Off. Foreign Agr. Relat., Foreign Agr., 3 (1939), No. 10, pp. 431-498, figs. 26)*.—The physical factors affecting agriculture and agricultural producing areas are described. The economic and political factors affecting agriculture, the requirements in agricultural products, the status of crop and livestock production, the growth in foreign agricultural trade, and the outlook for agriculture in the country are discussed.

Land credit practices and successful farm operation, R. R. Renne. (Mont. Expt. Sta.). *(Jour. Land and Pub. Util. Econ., 14 (1938), No. 4, pp. 442-451, figs. 4)*.—This is a discussion of land credit practices, farm mortgage indebtedness, farm bankruptcies, etc., in Montana, later reported in Montana Station Bulletins 360 (E. S. R., 80, p. 122) and 368 (E. S. R., 81, p. 125).

Recent developments in tenancy programs in North Carolina, R. M. Williams. (Univ. N. C.). *(Jour. Land and Pub. Util. Econ., 14 (1938), No. 2, pp. 208-210)*.—Some of the developments in tenancy programs in North Carolina under the Farm Security Administration and the Bankhead-Jones Farm Tenant Act are described.

Landlord-tenant relationships in renting Missouri farms, J. F. Timmons *(Missouri Sta. Bul. 409 (1939), pp. 48, figs. 5)*.—This bulletin presents a study which concentrated on the improvement of farm leasing arrangements and in addition includes pertinent information reported in bulletins previously noted (E. S. R., 32, p. 791; 43, p. 190; 68, p. 111) and data as to investments, receipts, expenses, income, etc., of landlords and tenants in Harrison County in 1937. Using data for 360 renting systems, of which 171 were cash and crop-share, 140 crop and livestock, 36 straight crop-share, and 13 cash, the relation between quality of land and renting systems and the different types of renting are described, and content of arrangements in leases that have been conducive to the welfare of the parties and maintenance of the farms are discussed. A suggested flexible farm lease form is included. This form is designed for use for crop-share, cash, or crop-livestock share rent, with deletions of such sections as do not apply to any particular type of renting arrangement.

Landlord-tenant relations in the Southwest with special reference to Oklahoma, P. Nelson. (Okla. A. and M. Col.). *(Southwest. Social Sci. Quart., 19 (1939), No. 4, pp. 362-369)*.—This is a discussion of some of the landlord-tenant relationships in the southwestern part of the United States, especially in Oklahoma. It is based on data obtained in studies having other primary objectives.

Taxation and tax delinquency of farm land in southwestern North Dakota *(North Dakota Sta. Bimo. Bul., 2 (1939), No. 1, pp. 11-16)*.—This article summarizes the findings reported in an unpublished report of S. Wilner, U. S. D. A. Bureau of Agricultural Economics, of a survey in 14 counties of the State south and west of the Missouri River. Tables are included and discussed showing by counties the taxable valuation of rural real estate, urban real estate, public utilities, and personal property in 1935, and the nontax-delinquent rural land acreages delinquent 1, 2, 3, 4, and 5 yr. or over and the tax-exempt acreage December 31, 1936. The reasons for the large amount of delinquency and some means of reducing it are briefly discussed.

The probable economic effects of a homestead exemption act on public revenues in South Carolina, G. H. Aull *(South Carolina Sta. Bul. 323 (1939),*

pp. 30, figs. 5).—This study was made to ascertain the number of homesteads—properties occupied by owners—in the various taxing units and their distribution by assessed value groups, and determine the probable effects of specified homestead exemptions on property-tax receipts.

Of the 260,412 real estate returns examined, 38 percent were classified as homesteads. The total assessed value of the homesteads was 20.53 percent of the assessed value of all property and 38.96 percent of that of all real estate. Of the total returns those with assessed values of less than $500 (average $196) constituted 65.73 percent of the number and 18 percent of the total value, and those with values of $500 to $999, 18.92 percent of the number and 18.28 percent of the total value. With a $500 homestead exemption from 3.8 to 23.6 percent, State average 9.5 percent, of the taxable property in different counties would be exempted, and the tax return increases necessary to offset the reduction would vary from 4 percent to 30.9 percent, State average 10.5 percent. In 486 of the 1,870 school districts with a $500 exemption, property-tax receipts would be decreased less than 10 percent, in 775 10 to 19.99 percent, in 425 20 to 29.99 percent, and in the other 184 from 30 to over 50 percent. For the entire State 9.5 percent of the total taxable property would be exempt with a $500 homestead exemption, 13.3 percent with a $1,000 exemption, 15.1 percent with a $1,500 exemption, 16.2 percent with a $2,000 exemption, 17.5 percent with a $3,000 exemption, and 20.5 percent with complete exemption. The percentages of the total valuation of homesteads at present for different groups on the basis of current assessed value are: Less than $500 18.7 percent, $500 to $999 21.5 percent, $1,000 to $1,499 13.2 percent, $1,500 to $1,999 8.2 percent, $2,000 to $2,999 10.3 percent, and $3,000 and over 28.1 percent. With a homestead exemption of $500, the total valuation would be reduced from approximately $72,515,000 to approximately $38,805,000, and the percentage for the different groups to 0, 11.1, 14.3, 10.9, 15.2, and 48.5 percent, respectively.

Illinois assessors' manual, 1939, S. E. LELAND ET AL. (*[Springfield]: Ill. Tax Comn., 1939, pp. 384, figs. [42]*).—This manual, prepared for assessment officials and taxpayers of Illinois, presents facts as to methods of assessment that have proven effective in other States and the law relative to assessments in Illinois. The chapter on assessment of farm real estate includes excerpts from or adaptations of papers presented at the annual meeting of local assessors and the State Tax Commission by members of the Illinois Experiment Station as follows: H. C. M. Case on types of information available, R. S. Smith on nature of soil type ratings and their use in assessing, C. L. Stewart on conversion of soil ratings into land values, G. D. Smith on relationship between land ratings and land prices, and H. C. M. Case on other factors affecting farm land values.

Price fixing by government in the United States, 1926–1939: A selected list of references on direct price fixing of agricultural products by the Federal and State Governments, L. O. BERCAW (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 79 (1939), pp. VII+214*).—This selected list of references supplements the one on price fixing by governments 424 B. C.–1926 A. D. (E. S. R., 56, p. 388), but is limited to the subject of direct price fixing by Federal and State Governments except for incidental references on indirect price fixing and price stabilization and control. Of the 645 references, 134 are general and 416 are on fluid milk. The remainder are on butter, coffee, cotton, evaporated milk, fruits, nuts, bees, grain, and war-time price fixing. References are included on the marketing agreements, licenses, and orders issued by the A. A. A., and on State legislation in 1937 and 1938 relative to control of and price

fixing for milk. A few references are included on price fixing proposals, cost as a basis for price fixing, and a few publications prior to 1926 but omitted from the previous bibliography.

Crops and Markets, [August–September 1939] (*U. S. Dept. Agr., Crops and Markets, 16 (1939), Nos. 8, pp. 153–180, figs. 2; 9, pp. 181–204, fig. 1*).—Both numbers include crop and market reports of the usual types. No. 8 also includes tables showing by States for the cotton States the sales of fertilizers by years 1932–39, and data as to the use of commercial fertilizers on cotton 1938 and 1939.

The international grain trade, A. A. Hooker (*London: Isaac Pitman & Sons, 1939, 2. ed., pp. X+170, [figs.] 2*).—This is the second edition of a volume previously noted (E. S. R., 78, p. 415).

RURAL SOCIOLOGY

The beginnings of rural social studies in the United States Department of Agriculture, D. Sanderson. (Cornell Univ.). (*Rural Sociol., 4 (1939), No. 2, pp. 219–221*).—The author calls attention to the origin of the Rural Organization Service which, financed for a year by General Education Board funds, became attached to the Office of Markets, which in turn became the Office of Markets and Rural Organization in 1914 and the Bureau of Markets in 1917.

The work of the Division of Farm Population and Rural Life of the Bureau of Agricultural Economics, U. S. Department of Agriculture, C. C. Taylor. (U. S. D. A.). (*Rural Sociol., 4 (1939), No. 2, pp. 221–228*).—The author gives a discussion of his current program of research as described at the meeting of the Rural Sociology Society in Detroit, Mich., in December 1938.

North Dakota farm population estimates January 1, 1939, D. G. Hay (*North Dakota Sta. Bimo. Bul., 2 (1939), No. 1, pp. 9–11*).—An estimated decrease in the farm population of the State during 1938 by 6,000, or approximately 1.75 percent, is analyzed and discussed.

Education of rural relief group presents challenge to various agencies in Colorado, R. W. Roskelley (*Colo. Farm Bul. [Colorado Sta.], 1 (1939), No. 4, pp. 9, 10, figs. 3*).—A finding that the educational attainment of the rural relief population of the State is lower than that of any other single class of significant size (39.1 percent not going beyond the sixth grade) is analyzed and discussed.

The sociology of drought, A. D. Edwards. (Va. Expt. Sta.). (*Rural Sociol., 4 (1939), No. 2, pp. 190–202, figs. 3*).—This study of a drought area county in the southern Great Plains attempts to analyze the strikingly similar effects of recurrent droughts on population, systems of farming, standard of living, community organization, public relief and assistance, and attitudes and opinions. The general pattern of social changes during drought is summarized. An outstanding feature of the recent drought of 1932–36 has been the large amount of Federal assistance which has served to stabilize the farming economy. Recommendations to avert the most disastrous effects of future droughts do not involve a complete shift from wheat growing, but rather a better adaptation of this type of farming to the climate of the Great Plains along with increased diversification and greater emphasis on measures designed to control soil blowing.

Rural youth studies in the United States, R. M. Williams. (N. C. Expt. Sta.). (*Rural Sociol., 4 (1939), No. 2, pp. 166–178*).—In many studies of rural youth made in recent years, analysis of the findings shows a residue of

empirical generalizations relating to migration, employment and occupational status, income, education, leisure-time activities, and organizational participations. The problems of youth are found to reflect regional characteristics as well as trends in the total social organization. Evidence points to important tendencies of "urbanization" and "secularization" in rural society as exemplified in the youth population. An age cycle in the relation of youths to the institutional framework of their communities is indicated by several studies.

Monographic youth studies have made valuable contributions but have sometimes lacked adequate conceptualization of the facts observed. The strategic importance of research on youth at the present time lies in the position of his group as a focus of societal tensions. Suggestions are offered as to promising approaches for further research.

Fundamentals of housing study, J. E. Davies (*Thesis, Columbia Univ., New York, 1938, pp. VII+355*).—The author lists the factors basic to an understanding of American housing problems.

Conflict in a New England college town, V. A. Rapport. (Conn. State Col.). (*Social Forces, 17 (1939), No. 4, pp. 527–532*).—The author reports the study of "town v. college" at Storrs, Conn.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

A study of the work of the land-grant colleges in the Tennessee Valley area in cooperation with the Tennessee Valley Authority, C. R. Ball (*Tenn. Val. Coor. Com., 1939, pp. 76*).—This publication presents the material with slight revisions, principally in the statistical data, previously noted (E. S. R., 80, p. 433).

Meeting the challenge of agriculture (*U. S. Dept. Agr., Ext. Serv., 1939, pp. V+104*).—This is a report (E. S. R., 81, p. 139) of the Extension Service on extension work in agriculture and home economics in 1936. It discusses how the agricultural conservation program fits into the extension system, and describes the work and accomplishments in improving crop and conservation practices, in solving problems of the livestock industry, in homemakers' activities, in 4–H Club work, in rural Negro extension work, and in educational programs with exhibits, motion pictures, and other visual aids. Appendixes include tables showing the results of work for the year ended November 30, 1936, and funds (Federal and State) for the fiscal year ended June 30, 1936.

Agriculture and farm life, H. A. Phillips, E. A. Cockefair, and J. W. Graham (*New York: Macmillan Co., 1939, pp. XIII+496, [figs. 199]*).—This is a textbook for use in teaching elementary agriculture. The 32 chapters are arranged in 10 units as follows: Farming as an occupation, the farmer works with life, dairying and poultry raising, the field crops, horticultural crops, the apiary, soils and their conservation, meat and other animal products, farm power and machinery, and the business of farming. A plan of study by months is outlined covering two 8-mo. years from September to April.

Outlines of agricultural economics, G. W. Forster, M. C. Leager, S. L. Clement, and M. T. Matthews (*Ann Arbor, Mich.: Edwards Bros., 1939, pp. VII+89*).—Included are outlines for five lectures on the field of agricultural economics, our economic system, the nature and development of modern farming, and types of farming in the United States, five each on records and accounts and farm finance, six each on farm marketing and rural social-economic relations, and three on farm taxation. The lectures are designed to meet the needs of general students whose curricula cannot include more specialized courses.

FOODS—HUMAN NUTRITION

Nutrition, M. S. Chaney and M. Ahlborn (*Boston: Houghton Mifflin Co., [1939], rev. ed., pp. XXV+436, figs. 56*).—This book, previously noted (E. S. R., 72, p. 865), has been revised in keeping with recent advancements in the field of nutrition. Although the general form of the book has been retained, substantial changes have been made in the text. The vitamin chapters have been completely rewritten, and changes in other chapters have been made to include new studies on human subjects and to amplify the emphasis on public health aspects. Tables have been revised to include more recent and more usable data, and bibliographies have been brought up to date.

The forty-third report on food products and the thirty-first report on drug products, 1938, E. M. Bailey (*Connecticut [New Haven] Sta. Bul. 426 (1939), pp. 56*).—This is the annual report of routine analyses of foods and drugs (E. S. R., 80, p. 417). Beverages of the carbonated type and certain ones with vitamin C additions, breads submitted to school cafeterias, a cottonseed bread (and the claims made for it), sausage and other meat products, vitamin D milks, vinegar, vegetable shortening compounds, eggs, and molasses are among the products considered. Data on certain mineral constituents are reported for the eggs and molasses.

Foods and drugs, E. R. Tobey (*Maine Sta. Off. Insp. 171 (1939), pp. 121–188*).—This annual report is devoted chiefly to the results of analysis and sanitary inspection of 1,312 samples of milk and 311 samples of cream. As in the preceding report (E. S. R., 80, p. 557), data are given on samples of oil used for packing sardines as well as for 81 samples of maple sirup, 72 of shucked clams, 8 of shucked oysters, and a number of miscellaneous food and drug products.

The supplementary value of the banana in institution diets, I, II (*Jour. Ped., 15 (1939), No. 1, pp. 25–42, figs. 8; pp. 43–52, figs. 4*).—This study is presented in two parts dealing with the effect of the banana on growth and on the bodily stores of vitamin C.

I. *Effect on growth in height and weight, ossification of carpals, and changes in Franzen indices,* L. J. Roberts, R. Blair, G. Austin, and G. Steininger.—This phase of the study reports the results of supplementing the diet of over 100 boys from 8 to 16 yr. of age and living in one institution with 2–3 bananas daily for a period of 9 mo. The institution diet, subjected to a quantitative dietary study at the beginning of the experiment, was found to be reasonably adequate, but the supplement of 2 bananas daily is calculated to have made an 8 percent increase in calories and vitamin G, a 10 percent increase in iron and in vitamins A and B_1, and the significant contribution of a 60 percent increase in vitamin C.

Findings on the physical status of the experimental and control subjects are reported as mean values for 80 boys in each group who were matched at the beginning of the study for age, height, and weight. The experimental boys made slightly the greater gain in mean weight (0.9 lb.) and height (0.15 in.), showed slightly the greater progress in ossification of the wrist bones (3.2 v. 2.9 for mean gain in Carter index), and, according to Franzen measurements, made greater mean gains in arm girth, subcutaneous tissue, and weight and also in the scores for these items. On every basis of comparison the experimental boys showed some advantages over the controls, and although the differences are small, the authors consider that they are probably real.

II. *Capillary resistance and reduced ascorbic acid in the blood plasma,* L. J. Roberts, M. H. Brookes, R. Blair, G. Austin, and I. Noble.—Another phase of the study just discussed dealt with the effect of the banana supplement (furnishing 17–26 mg. ascorbic acid daily) on the vitamin C stores. The capillary resist-

ance of boys in both groups was determined at intervals, and at the end of the study the reduced ascorbic acid in the blood plasma was also determined. With the former test the differences were not statistically significant, although they were consistent in direction. The most significant differences, however, were those for blood ascorbic acid. The mean for 47 experimental boys was 0.89 mg. of ascorbic acid per 100 cc. of plasma, and for the matched controls it was 0.69 mg. The statistically significant difference is in favor of the experimental boys.

Judging from this study, the banana, though not a rich source of vitamin C, is nevertheless a dependable source. Its liberal use in institutions of the type studied would be a factor of safety in providing vitamin C in economical and palatable form. The results of the study as a whole are briefly evaluated, and tentative allowances for the various dietary constituents are proposed for boys from 10 to 12 yr. of age.

Superior cakes possible at high altitudes despite beliefs to contrary; recipes given, W. E. Pyke and G. Johnson (*Colo. Farm Bul.* [*Colorado Sta.*], *1* (*1939*), *No. 4, pp. 21–23*).—One reason given for the superiority of cakes made by adjusted recipes at high altitudes is the increase in egg content without danger of toughness made possible by the greater tenderness of eggs cooked at the lower internal temperature of batters at high altitudes. A similar increase in milk also increases the nutritive value and prevents the cakes from becoming dry. Volume for volume, the richer cakes are actually less expensive.

Recipes are given for 3-egg, 4-egg, and 2-egg cakes, the first two of high and the third of normal sugar ratio. The 4-egg formula is recommended especially for use at 10,000-ft. altitude and the 3-egg formula for altitudes of 3,000–7,500 ft.

Butter and lard are considered less satisfactory than hydrogenated shortening for high-altitude cake of high sugar content. Although the recipes are given in volume measurement, it is emphasized that really accurate measurements can be made only by weight. "Until the housewife is willing to adapt herself to measurement by weight, it will remain difficult to obtain results that approach uniformity at higher altitudes. With weigh measurement, cakes superior to those produced at low altitudes are easily obtained."

Civilian tinned ration (*Brit. Med. Jour., No. 4097* (*1939*), *pp. 128–130*).—A food list sufficient for a week's emergency ration for a family of five (man, wife, and children 6–8, 10–12, and 12–14 yr.) is given. The list contains only canned or dried foods that are generally available from British supplies and are at the same time economical from the standpoint of cost, dietary adequacy, and storage space requirement.

[**Nutrition studies by the Arizona Station**] (*Arizona Sta. Rpt. 1938, pp. 55–60*).—Included in this progress report (E. S. R., 79, p. 560) are summaries of an extension of previously noted iron studies (E. S. R., 78, p. 888); dental studies, including further work on the effect of vitamin A deficiency upon dentition (E. S. R., 81, p. 145), the toxicity of fluorine in different combinations, and the effect of various dietary inadequacies upon dentition; vitamin studies, including the effect of mineral oil on utilization of vitamins A and D and visual threshold measurements for vitamin A; and pellagra studies on monkeys.

The hemoglobin content of human blood, V. C. Myers and H. M. Eddy (*Jour. Lab. and Clin. Med., 24* (*1939*), *No. 5, pp. 502–511*).—Recent data on the red blood cell count and on the hemoglobin content of the blood of young adult males and young adult females are summarized.

In the experimental work carried on, the hemoglobin content of the capillary blood of 159 young adults (111 males, 19–30 yr., average 23 yr., and 48 females, 17–30 yr., average 20 yr.) residing in the locality of Cleveland was determined

by each of three micromethods. The males averaged 15.8 gm. of hemoglobin per 100 cc. of blood, and the females averaged 13.0 gm. Good agreement was shown by the three methods, the average by the Newcomer acid hematin method being 0.5 percent higher than that obtained by the Hanzal iron method (E. S. R., 70, p. 154), and that by the Bing and Baker benzidine method being 0.8 percent lower. These results, as well as the values summarized from the literature, indicate that it is legitimate to calculate hemoglobin from figures for total blood iron.

The gastrointestinal response of children to test meals of barium and pasteurized, evaporated, and base-exchanged milks, L. Reynolds, I. G. Macy, and H. J. Souders (*Jour. Ped., 15 (1939), No. 1, pp. 1–12, figs. 2*).—The relation of gastrointestinal motility to milks of different curd tension was studied by noting the response of seven normal healthy children aged 7–11 yr. to test meals composed of 2 oz. of barium sulfate and 4 oz. of the test milk (pasteurized milk, evaporated milk diluted 1 : 1 with water, or a "base-exchanged" milk). Data reported on the proximate and mineral constituents indicate that the base-exchanged milk gave up approximately 17 percent of its calcium, 14 percent of its phosphorus, 6 percent of its chlorine, and 32 percent of its potassium in exchange for an increase of 85 percent in sodium and 7 percent in magnesium.

Roentgen examinations were made at frequent intervals until the meal had passed out of the stomach and at 24, 48, and 72 hr. after ingestion. A total of 181 exposures was made. For the pasteurized, evaporated, and base-exchanged milks, the average gastric emptying times were 227, 214, and 193 min., respectively. "The roentgenograms taken 10 min. after ingestion indicated that the soft-curd milks (evaporated and base-exchanged) began emptying from the stomach in much less time than the pasteurized milks. In nine instances the soft-curd milk had reached the duodenum and in four of these had entered the jejunum after 10 min., while in only one exposure at the 10-min. interval had the pasteurized milk meal left the stomach." The roentgenograms indicated that the processed milks formed fluffier, more evenly dispersed masses. These presented greater surface areas to the digestive juices in the small intestine and admitted of a more orderly progression of the soft-curd milks throughout the alimentary canal.

The vitamin A content of human milk [trans. title], A. Chevallier, P. Giraud, and C. Dinard (*Compt. Rend. Soc. Biol. [Paris], 131 (1939), No. 16, pp. 373–375*).—Determinations of the vitamin A content of 60 samples of human milk from 18 women receiving the same well-balanced diet indicated that the amount of vitamin A varies greatly in the milk of different women, that it tends to increase as the lactation period progresses, and that it varies from day to day even for a single subject. Thus, in one subject the amount of vitamin A, expressed as γ per 100 gm. of milk, was found to be at levels of 12γ, 12γ, and 15γ on different days in the early part of the lactation period and at levels of 20γ and 36γ on certain days toward the end of the period. For the women under 20 yr. the content varied from 18γ to 47γ and averaged 25γ while in the group 30 yr. of age or older the values were in general appreciably lower and averaged only 18γ. Fat determinations made on the same samples showed fat contents varying from 20 to 44 percent to be associated with irregular increase in vitamin A between the limits of 12γ and 26γ. These results led the authors to conclude that there is a general though not an exact relationship between percentage of fat and the vitamin A content of human milk.

The comparative vitamin A content of blood and milk [trans. title], A. Chevallier, P. Giraud, and C. Dinard (*Compt. Rend. Soc. Biol. [Paris], 131*

(*1939*), *No. 16, pp. 396–398*).—Continuing the study noted above, vitamin A determinations were made on the blood of lactating women, the samples being drawn after fast periods of at least 15 hr. At the same time samples of colostrum or milk, as the case might be, were obtained for analysis. In the blood of the 15 subjects the vitamin A averaged 18γ per 100 cc. In all but 3 of these the concentration in the blood was always higher than that in the milk. In 1 subject, for example, the blood value was fairly constant at 31γ, although the milk on different days contained 25γ, 15γ, 22γ, and 22γ per 100 gm. In the 3 subjects noted as exceptions blood values of 26γ, 15γ, and 12γ corresponded to milk values which varied, respectively, from 18γ to 30γ, from 12γ to 30γ, and from 14γ to 17γ. In a few cases the colostrum was analyzed. Samples obtained from 1 subject at intervals over an 8-hr. period gave vitamin A values of 50γ, 48γ, 31γ, 31γ, and 43γ per 100 gm. For 2 other women values for single analyses were 62γ and 87γ, respectively. For these same subjects, however, the blood values varied only from 11γ to 18γ. In one experiment on a lactating dog the blood value remained contant at 51γ, whereas values of 130γ, 62γ, and 93γ were obtained for the milk.

Vitamin A and the Reid-Hunt reaction [trans. title], E. ALTENBURGER and H. WENDT (*Klin. Wchnschr.*, *18* (*1939*), *No. 12, p. 418*).—The Reid-Hunt reaction refers to the behavior of thyroxine in protecting the animal from the toxic effect of acetonitrile. If vitamin A were antagonistic to thyroxine, then simultaneous injections of vitamin A and thyroxine would not protect test animals against acetonitrile, as would injections of thyroxine alone. Experiments with mice receiving as much as 1¼ times the lethal dose of acetonitrile indicated that thyroxine injections of 5γ daily for 3 days did offer some protection, since only 10 percent of the animals died as compared with a 50-percent mortality in those groups not receiving the thyroxine. Animals that also received vitamin A injections at the rate of 8,000 biological units for every 5γ of thyroxine were apparently not as well protected against the acetonitrile as those receiving thyroxine only, since the former group evidenced a 25-percent mortality. At higher levels of acetonitrile, however, no such antagonistic action of the vitamin A could be observed regardless of whether it was given orally or by injection. The authors inferred that this might be explained by the difference in absorptive rates. They conclude, therefore, that the Reid-Hunt reaction is not a suitable test for studying the antagonistic action between vitamin A and thyroxine.

Isosterism in the vitamin B complex, F. C. SCHMELKES (*Science*, *90* (*1939*), *No. 2327, pp. 113, 114*).—Thiazole-5-carboxylic acid, which is isosteric with nicotinic acid, is reported as stimulating the growth of dysentery bacilli on Koser's synthetic medium, the activity being about 0.1 percent of that of nicotinic acid. Investigations concerning the activity in curing blacktongue in dogs are inconclusive. A synthetic isoster of vitamin B_1 is likewise reported as showing vitamin B_1 activity, although the experimental data do not as yet permit of exact quantitative evaluation.

The action of vitamins B_1 and B_2 (lactoflavin) on the water excretion in normal children [trans. title], I. GATTO (*Klin. Wchnschr.*, *18* (*1939*), *No. 9, pp. 303–305, figs. 9*).—In these tests children 6 to 10 yr. old received intramuscular injections of 1, 10, or 20 mg. of vitamin B_1 (as Betaxin) just prior to drinking 500 cc. of water, all of which was taken within a 5-min. period. Similar tests were carried out with vitamin B_2 (lactoflavin) in amounts varying from 2 to 4 mg. The administrations were made in the morning before the fast of the night was broken. Urine specimens were collected every 30 min. over a period of 3 hr. Control experiments involving the water intake, but no vitamin administration, were carried out with all children. In comparison with these, the test cases indicated that the vitamin B_1 in the amounts given had exerted no diuretic action and had not changed the elimination rhythm. Administration

of the vitamin B_1 resulted in a decided decrease in the elimination in the first hour period, followed by a compensating increase in the next 2 hr. Vitamin B_1, therefore, exerted no diuretic action, although it did affect the elimination rhythm.

The vitamin B_1 test in humans [trans. title], A. HILDEBRANDT (*Deut. Med. Wchnschr., 65 (1939), No. 16, pp. 639–641*).—The vitamin B_1 elimination (urinary) in healthy nonpregnant women on the regular hospital diet varied from 100γ to 450γ per 24 hr. The elimination was usually greatest after the main meal of the day and was lowest at night. The urinary excretion of 5 women in the eighth month of pregnancy and on this same hospital diet was somewhat lower (52γ–97γ). The 25 lactating women studied showed no uniform behavior.

In another series of tests on nonpregnant, pregnant, and lactating women, each subject received daily intramuscular injections of 10 mg. of the vitamin on each of 4 successive test days. In all three groups the subjects eliminated most of the injected portion within the first 3 hr., after which there was a sudden and sharp drop in the urinary excretion of the vitamin. In none of the groups did the subjects show any definite relation between the elimination on the test days and that on the control days preceding and following the test period. For the nonpregnant women the elimination was seldom greater than 50 percent of the test dose, whereas it was even lower as a rule with the pregnant women. In the case of the lactating women the vitamin B_1 content of the milk increased from preinjection levels of 8γ–12γ percent to levels of 18γ–32γ percent in the second to fourth hours after injection of the test dose, followed by a decrease to 11γ–18γ percent in the fourth to eighth hours. Even counting the increased excretion in the milk, not all of the injected vitamin was accounted for. The vitamin content of the milk seemed to reach a maximum which was not exceeded even with increased doses (20 mg.) or with longer test periods. This maximum differed with the various individuals, the highest values obtained amounting to 50γ–60γ percent.

Because of the unexplained variation in elimination response, the author considers that this injection test is not suitable for the determination of vitamin B_1 hypovitaminosis.

Vitamin B_1 in cerebrospinal fluid, G. G. VILLELA (*Science, 89 (1939), No. 2307, p. 251*).—In this brief note the detection of thiamin in the cerebrospinal fluid is reported. The tests were made with 10–15 cc. of the fluid, employing a frankonite adsorbate, which was subjected to the Phycomyces test as well as the thiochrome test. The Phycomyces test showed higher values than the chemical test. In 30 cases associated with various mental diseases, the values obtained averaged 2.5γ percent. Two cases (catatonia and depressive state) showed the highest values, but in other cases (myxedema with cretinism and epilepsy with dementia) no trace of thiamin could be found by either test.

Vitamin B_1 and cocarboxylase in animal tissues, S. OCHOA and R. A. PETERS (*Biochem. Jour., 32 (1938), No. 9, pp. 1501–1515, figs. 6*).—The decarboxylation of pyruvic acid by alkaline washed yeast in the presence of cocarboxylase was greatly stimulated by vitamin B_1. Since the effect was obtained in an atmosphere of nitrogen, as well as in air, it seemed likely that the stimulating effect was not due to removal of acetaldehyde by oxidation or dismutation. Hexosediphosphate in the total absence of vitamin B_1 stimulated this decarboxylation if cozymase, as well as pure cocarboxylase, was present. Bivalent manganese also greatly stimulated the carboxylase system if present in sufficient concentrations. Based on this activation of cocarboxylase action by vitamin B_1, a method was devised for the separate estimation of cocarboxylase and the free vitamin in the same solution or tissue extract. When this method was applied to boiled extracts from rat and pigeon brain and liver, the results indi-

cated that there was much less vitamin B_1 than cocarboxylase in these extracts. Both cocarboxylase and vitamin B_1 were found in extracts of muscle and heart. The cocarboxylase content of tissues was much reduced in conditions of B_1 avitaminosis and specifically so in the brain tissue. There was soon an increase in the latter, however, and also in the heart after a short period of administration of the vitamin. Administration of vitamin B_1 led to an immediate accumulation of both vitamin B_1 and its pyrophosphoric ester in the liver. This brings the liver into prominence in the metabolism of vitamin B_1.

The influence of vitamin B_1 on the glycolysis of liver cells [trans. title], F. Steigerwaldt (*Klin. Wchnschr., 18 (1939), No. 12, pp. 431-434*).—Tissue sections of liver, muscle, and kidney tissue of normally nourished mice and rats, with and without vitamin B_1 additions, showed no difference in respiratory rate as determined at 37° [C.] under standardized conditions in a slightly modified Warburg respiratory apparatus. Additional studies were made on liver and on muscle tissue for which the Warburg quotient was determined. This quotient, representing under aerobic conditions the ratio of the formed lactic acid (expressed as CO_2) : O_2 used up in respiration, varied from 0.030 to 0.070 for mouse liver sections to which no vitamin B_1 had been added. For similar sections in a medium containing vitamin B_1 supplements, this quotient varied from 0.56 to 1.2. These higher quotients indicated a decided increase in glycolytic action of the cells under the influence of vitamin B_1. These were the paired values reported, but the author called attention to the fact that many liver sections under the influence of vitamin B_1 supplements did not show this increased quotient. Liver tissue of rats and rabbits responded similarly to that of mice. In no case, however, did muscle tissue show an increased Warburg quotient in the presence of vitamin B_1. On the basis of these results it was suggested that the liver cells have the capacity, which isolated muscle cells lack, of converting the vitamin B_1 into a diphosphorylated product, cocarboxylase; this product effects a break-down of the pyroracemic acid into lactic acid in the glycolytic destruction of sugar.

The prevention of toxic manifestations of an excess of vitamin B_1 by supplements of manganese to the diet, D. Perla (*Science, 89 (1939), No. 2302, pp. 132, 133*).—The present work confirmed earlier observations that rats on a standard adequate diet and receiving a supplement of 50 International Units of vitamin B_1 per rat per day evidenced after one generation interference in lactation, loss of maternal instinct, cannibalism, and progressive loss of fertility. Elimination of the excess vitamin supplement or its reduction to 20 units daily resulted in restoration of normal lactation and normal interest in the young. The addition of small amounts of manganese to the high vitamin diet resulted in improvement so that the rats which had shown loss of maternal instinct and cannibalism now bred and raised normal litters.

Further studies showed that rats raised on the normal diet and given 200 units of vitamin B_1 failed to develop the toxic symptoms if at the same time they received daily supplements of 2 mg. of Mn as $MnCl_2$. In the controls receiving only the vitamin B_1 supplement cannibalism and interference with lactation occurred. These results demonstrate that manganese is essential in the utilization of vitamin B_1. It is suggested that the manganese acts as an oxidative catalyst in the utilization of vitamin B_1, and that large excesses of the vitamin would effect an exhaustion of the available manganese in the tissues with the resulting appearance of symptoms typical of manganese deficiency. It is also suggested that a variation of manganese in the diet may greatly affect the vitamin B_1 requirement, and further that an adequate supply of manganese must be made available in vitamin B_1 therapy.

Occurrence of vitamin B_2 (lactoflavin).—III, Vitamin B_2 in nutrient yeasts and in yeast-vitamin extracts [trans. title], J. SCHORMÜLLER (*Ztschr. Untersuch. Lebensmtl., 77 (1939), No. 5, pp. 459–466*).—Lactoflavin was determined in these products by converting it, through irradiation, to the chloroform-soluble lumiflavin, which was then determined colorimetrically. The lactoflavin content of the eight samples of yeast, chiefly bottom fermentation brewers' yeasts, varied from 1.43 to 4.47 mg. per 100 gm. of dry matter (no moisture figures were reported, however). In the yeast extracts the variation was from 4.01 to 6.96 mg. per 100 gm. of dry matter, while a granular concentrate from the extract contained 0.635 mg. percent. These data are compared with values cited from the literature for similar products analyzed chemically or assayed by biological methods. A few clinical yeast preparations from the German market were also analyzed. Experiments in which the extracts were dialyzed against water indicated that 25–35 percent of the flavin was nondialyzable. This portion is assumed to be bound as the yellow ferment in compounds of high molecular weight. Approximately 32 percent of the flavin in the extracts was found to be in the free state, in contrast to yeast in which about 90 percent of the flavin was combined as flavinphosphoric acid. On the basis of these analyses, and assuming an optimum daily human requirement of from 2 to 3 mg. of flavin, the author calculates that it would require from 70–100 gm. of brewers' yeast, 50–80 gm. of the so-called vitamin yeasts, or 40–50 gm. of yeast extract to meet these needs.

Multiple nature of the rat "filtrate factor"—a component of vitamin B_2, A. MOHAMMAD, O. H. and G. A. EMERSON, and H. M. EVANS. (Univ. Calif.). (*Science, 90 (1939), No. 2338, p. 377*).—The authors report briefly on a study interpreted to indicate that the filtrate factor, as described by Lepkovsky et al. (E. S. R., 76, p. 839), consists of two entities, one of which is extracted from acid solution by diethyl ether, while the other remains in the residue. The methyl alcohol-soluble fraction from cane molasses was adsorbed on fuller's earth, and from the filtrate remaining three preparations were obtained, two of them being ether extracts of the acidified filtrate obtained by successive 72-hr. extractions with ether and the third being the residue remaining. The three preparations were fed to female rats on a vitamin B complex-deficient diet supplemented with thiamin, riboflavin, and a source of vitamin B_6. Each preparation was fed for 56 days at a level equivalent to 3 gm. of the molasses. With the first extract and with the residue the gains in weight above the controls were 60 and 58 gm., respectively; with the second extract there was no gain. Although the rats in two of the groups made similar gains, those receiving the extract preparation showed in the black, gray, and hooded rats no change in the pelage coloring, whereas those receiving the residue portion showed a marked graying of the black hair and a lightening of the gray hair. These results would seem to indicate that the "antigraying" activity, as first noted by Morgan et al. (E. S. R., 79, p. 566) and by G. Lunde and H. Kringstad, goes with the ether-extractable component of the filtrate factor.

It is also reported that the isoamyl alcohol extract from a rice bran preparation was not destroyed by heating in 1 N NaOH at 100° C. for 1 hr., thus indicating that the factor extractable is not identical with the "chick antidermatitis factor" which is destroyed by alkali.

The possibility of making a biochemical determination of vitamin C (a new method of determining ascorbic acid) [trans. title], L. RANDOIN and C. P. LEBLOND (*Bul. Soc. Chim. Biol., 21 (1939), No. 4, pp. 604–608, fig. 1*).—The authors have shown experimentally that the content of ascorbic acid (y) in the adrenals of a guinea pig is related to the daily dose administered (x)

according to the formula $y=68.44 \log (x+1)-4.90$. This formula has been used in determining the ascorbic acid content of any material essentially as follows:

Six guinea pigs are given each morning a definite rather large dose of the material to be studied, and after 18 days the animals are killed and the ascorbic acid content of their adrenals determined by indophenol titration. The average value found is used as y in the above equation. This method is thought to do away with the difficulty encountered in the straight chemical analysis of the material to be tested of interference with other substances reacting with indophenol.

New biochemical method of determining vitamin C [trans. title], L. RANDOIN and C. P. LEBLOND (*Compt. Rend. Acad. Sci. [Paris]. 208 (1939), No. 12, pp. 941–943, fig. 1*).—Essentially noted above.

The vitamin C requirement [trans. title], W. NEUWEILER (*Klin. Wchnschr., 18 (1939), No. 22, pp. 769–772*).—The literature, including the work of the author and his associates, is reviewed, and the evidence is summarized as follows:

On the basis of blood values, the daily human requirement of ascorbic acid, not considering individual variations, is from 30 to 35 mg. as a minimum. Most authorities are agreed that 50 mg. is a better estimate of the daily need. The composition of the diet (fatty acids, vitamin D, etc.) influences the utilization and also the requirement of vitamin C. In certain conditions, as in illness, pregnancy, and lactation, an estimated intake of from 60 to 70 mg. is needed to prevent impoverishment of the body. An intake above the 30–35 mg. level is doubtless necessary to increase the resistance and performance of the organism. The bibliography refers chiefly to the German literature.

The usefulness of the rapid method of Gander and Niederberger for determining the deficit in vitamin C saturation [trans. title], H. BURMEISTER and K. WACHHOLDER (*Klin. Wchnschr., 18 (1939), No. 3, pp. 85–87*).—Male subjects were given ascorbic acid in daily doses of 300 mg. administered orally. A sample of urine collected from 7 to 8 hr. after the test dose was titrated with dichlorophenolindophenol. By this rapid method it was assumed that vitamin C saturation had been attained when the urine showed an ascorbic acid content of 5 mg. percent. The saturation deficit of the subject was then calculated as the daily dosage (300 mg.) times the number of days required to reach this saturation point. Values were determined simultaneously by the more accurate and detailed methylene blue titration method of Wachholder and Hamel (E. S. R., 79, p. 282). Comparison of results by the two methods indicated that the more rapid method would suffice if certain allowances were made in interpreting the results. Complete saturation could be assumed on the first day only if the titration value was considerably greater than the 5-mg. percent. Deficiencies of from 300 to 1,200 mg. were correct within ±100 mg. and those of 1,500 mg. or over too high by about 500 mg. These high results were obtained with persons having a high specific dynamic increase in the oxidative use of ascorbic acid. In such individuals the elimination fluctuated. Three hundred mg. was subtracted from the deficiency value if on the day after reaching the limit of 5 mg. percent the excretion fell. On the other hand, if the excretion value was near the 5-mg. percent limit, saturation was assumed to have been reached on that day if a very high elimination (over 20 mg.) occurred on the following day.

Increased elimination of ascorbic acid and hormone production in pregnancy [trans. title], H. WINKLER (*Klin. Wchnschr., 18 (1939), No. 11, pp. 372–374, figs. 2*).—The ascorbic acid elimination of each of six rabbits was followed daily throughout the period of pregnancy, during which time the rabbits re-

ceived intramuscular injections of a commercial vitamin C preparation in amounts of 50 mg. daily. Immediately after conception there was a definite though temporary increase in the urinary ascorbic acid. After this the excretion dropped to a level only slightly higher than the original and, with slight fluctuations, remained fairly constant until the seventeenth day. From this point there was in all cases a definite decrease that continued until just before parturition. On the day of parturition there was an enormous increase in the ascorbic acid elimination, amounting in some cases to as much as 6 times that of the low level just previous. After the litter was cast the excretion again dropped to normal. This increased elimination of ascorbic acid just previous to parturition was also noted in human subjects. In the latter case, however, the maximum rise in five pregnant females occurred on an average about 6 days *before parturition.*

The author considers these findings to be evidence in favor of his theory that vitamin C acts as an activator for the hormone-producing cells. After the organism's initial preparation for germination there is a temporary decrease in the need for hormone and activator, and this is associated with increased excretion of both of these substances. In the second third of the pregnancy period there is a retention of ascorbic acid preparatory for the increased output of work that will be necessitated by parturition. At this stage, therefore, there is a very definite decrease in the vitamin C excretion. That there has been storage of the vitamin C over this period is evidenced by the very great increase in its excretion after parturition, when the need for a hormone activator is no longer present.

The vitamin C exchange between mother and fetus [trans. title], J. MULLER (*Klin. Wchnschr., 18 (1939), No. 9, pp. 299–301*).—From a review of the literature on this subject, the author presents the following summary:

Vitamin C is not stored in the placenta and there is little possibility of the fetus having the higher ascorbic acid content. Comparative determinations of the vitamin C content of the liver of the mother, of the placenta, and of the liver of the fetus show that, apart from some variable differences, the vitamin C picture in the fetus is the same as in the mother. The findings contradict the assumption that there is synthesis in the fetus. All the vitamin C that the fetus uses is brought to it through the umbilical vein by way of the placenta. About 40 references to the literature are appended.

A study of vitamin C metabolism in lactating mothers, F. T. CHU, T. WOO, and C. SUNG (*Chin. Jour. Physiol., 13 (1938), No. 4, pp. 383–394*).—Four nursing mothers who served as subjects were hospitalized and given a basal diet low in vitamin C but adequate in other vitamins and in protein and calories. Vitamin C supplements were given during test periods. The amount of vitamin C in the milk and in the urine was determined during an initial period low in the intake of vitamin C, during a period when a specified amount of the vitamin was supplied, and during a subsequent period when the vitamin C supplement was withdrawn. During the test period the four subjects received, respectively, 380, 600, 108, and 500 mg. of ascorbic acid daily, which was administered as pure crystalline ascorbic acid in the second and last cases, but was obtained from 1,000 cc. of canned orange juice in the first case and from 600 gm. of cooked cabbage plus 600 gm. of raw turnip in the third case. These intakes were equivalent to 7.2, 22.2, 2.4, and 10.1 mg. per kilogram of body weight. For the several patients in the order given the peak of urinary excretion was attained on the eleventh, seventh, sixteenth, and fifth day, the amount excreted then representing 58, 58, 64, and 74 percent of the test dose. For the first three patients, who were in a state of vitamin C depletion before the experiment

began, the rate at which the urinary peak was reached varied directly with the intake per kilogram of body weight. The fourth patient had been in a state of dietary adequacy before the experiment, and the urinary peak appeared rapidly, even though the test dose was smaller than in case 2.

In these tests there was no sudden increase in the urinary excretion until a large amount of the vitamin had been added to the diet for a variable number of days. In the case of the milk, there was a very slow but steady increase in vitamin C concentration with increased vitamin C intake. After the vitamin C in the milk had reached a saturation level of about 8 mg. per 100 cc., this level was maintained for several days even after the extra supply of vitamin was discontinued. Judging the degree of vitamin C saturation by the type of urinary response to repeated daily test doses of the vitamin and noting the vitamin C concentrations of the milk at these times, it was concluded that a concentration of less than 4 mg. per 100 cc. of milk is indicative of a vitamin C deficiency in the body of the lactating woman. A concentration of 4–6 mg. percent is considered satisfactory, and values above 6 mg. percent indicate a state of relative saturation. By determining the amount of ascorbic acid needed to restore the depleted subject to saturation (as judged by urinary excretion), the daily vitamin C requirement for one of the lactating women weighing 45 kg. was determined as approximately 82 mg. The authors point out that "it was found practicable to raise the vitamin C concentration of human milk to an optimal level by feeding the lactating women with cabbage and turnip, which are easily available for families of low means."

Is there a hypervitaminosis in the case of vitamin C? [trans. title] H. Rietschel (*Klin. Wchnschr., 18 (1939), No. 27, pp. 923–925*).—Synthetic ascorbic acid was administered orally to infants from 2 to 7 mo. of age. The dosages, varying from 100 to 250 mg. per day, were given over 3- to 12-day periods. With these massive doses the blood picture in every case showed a marked increase in the thrombocyte (platelet) count. These findings, together with those of other investigators whose works are cited, are interpreted to mean that massive doses of vitamin C can result in hypervitaminosis, particularly in infants and children. Practically, the problem is of little importance in normal nutrition, but it is suggested that high levels of vitamin C may be of some therapeutic value.

Experimental investigations on the question of increased vitamin C utilization in fever [trans. title], O. Dobbelstein (*Klin. Wchnschr., 18 (1939), No. 17, p. 610*).—Male guinea pigs weighing from 300 to 350 gm. were placed on a scorbutic basal diet supplemented daily with 2 mg. of ascorbic acid. When ascorbic acid in the blood had reached a level of 0.43 mg. percent, fever was produced experimentally, either by the administration of pyretogenic drugs or by confining the animals in an incubator under conditions of elevated temperature and humidity. In the former case the average increase in body temperature (13 animals) amounted to 2° [F.] in 3 hr., and in this period ascorbic acid in the blood fell to a level of 0.21 mg. percent. In the latter case, the temperature elevation was 3.3° in 6 hr. (14 animals), and the ascorbic acid level dropped to 0.19 mg. percent. The greater utilization of vitamin C was apparently necessitated by the increased metabolism during the fever period. Further evidence that the effect was referable to increased metabolic rate was furnished by studying the reaction of animals given injections of thyroxine. In these animals the ascorbic acid in the blood fell likewise to half its original value after two injections of 1-mg. doses of thyroxine.

The magnitude of the vitamin C requirement in fever [trans. title], Falke (*Klin. Wchnschr., 18 (1939), No. 23, pp. 818–821, figs. 10*).—The vitamin C re-

quirement in fever was studied in 15 patients observed over 58 fever days and 72 days that were fever-free. The deficit determined by dosing with ascorbic acid and noting the excretion, and that determined from the height of the ascorbic acid curve in the blood of fasting patients, indicated the need for a total of 800–900 mg. over a period of 5 fever days. The vitamin C usage on fever days was about 100 mg. higher than that on fever-free days, as determined by noting the vitamin C balance at each of these times on a daily intake of 300 mg. During fever an intake of more than 300 mg. per day was needed to prevent a decrease in the vitamin C elimination.

The influence of vitamin C on the active hyperemia in the healing of fractures [trans. title], E. W. LEXER (*Klin. Wchnschr., 18 (1939), No. 6, pp. 208, 209, figs. 2*).—The healing of fractures in guinea pigs was observed. For those animals that were definitely scorbutic the administration of ascorbic acid (50 mg. orally for 14 days) brought about improvement in vascular proliferation, starting on the seventh day, and thereby facilitated healing of the fracture.

Vitamin C treatment in lead poisoning, H. N. HOLMES, E. J. AMBERG, and K. CAMPBELL (*Science, 89 (1939), No. 2310, pp. 322, 323, fig. 1*).—This preliminary report cites the evidence obtained on the beneficial effect of ascorbic acid treatment in cases of lead poisoning. These results, supplemented by test-tube experiments, indicate that vitamin C reacts with the toxic lead ions and forms a poorly ionized much less toxic lead compound. Thus the lead destroys the vitamin, but on the other hand generous vitamin C supplements to the diet remove the lead from the field of action. The obvious conclusion is that men exposed to lead hazard should include in their diet liberal quantities of foods rich in vitamin C or even synthetic vitamin C preparations.

Vitamin D potency of human breast milk, R. S. HARRIS and J. W. M. BUNKER (*Amer. Jour. Pub. Health, 29 (1939), No. 7, pp. 744–747*).—Bio-assay of a large (15 gal.) sample of human breast milk obtained from women in an urban community (Boston) in the months of December 1937 and January 1938 indicated a vitamin D content not over 4 U. S. P. XI units per quart. To conduct the assay it was necessary to prepare the nonsaponifiable fraction. With this low potency the authors consider that the antirachitic superiority of human milk over cow's milk in infant feeding cannot be attributed solely to the quantity of vitamin D which it contains.

The effect of vitamin E deficiency on the rat, I, II, M. M. O. BARRIE (*Biochem. Jour., 32 (1938), No. 9, pp. 1467–1473, figs. 2; pp. 1474–1478*).—Two papers are presented.

I. *Duration of gestation.*—The response of female rats, as evidenced by length of gestation period and by the number and condition of the young, was studied for groups lacking vitamin E, variously deficient in the vitamin, and adequately supplied with it. For the stock rats and the normal controls the gestation period averaged 22–23 days. Animals suffering from slight deficiency of the vitamin had gestation periods of 19–25 days (average 23 days), 67.5 percent of them falling within the normal range of 22–23 days. Those with a much more severe vitamin deficiency had gestation periods varying from 23 to 32 days (average 25.3 days), only 31.8 percent being within the normal range. In the case of rats fed on the vitamin E-free diet from weaning, positive mating and successful implantation were accomplished, but the fetuses were resorbed in utero.

Stock rats fed on a vitamin E-rich diet averaged 7.84 young per litter, all of which were born alive and were successfully reared. Positive controls fed on the vitamin E-free diet but receiving an adequate dose of vitamin E concentrate averaged 6.48 young per litter. Of these 5.87 were born alive, 0.63 were born

dead, and 4.40 were successfully reared. Corresponding averages of 6.05, 5.99, 0.06, and 1.55 were characteristic of rats slightly deficient in vitamin E, whereas 3.23, 1.28, 1.95, and 0.04 were the respective averages for rats severely deficient in vitamin E. These results indicate that the length of the gestation period in the rat partially deficient in vitamin E bears an inverse relation to the amount of vitamin E in the diet. These same results, together with weight curves, observations as to placental signs, and post-mortem uterine findings indicate further that the partially deficient animals are unable to develop all the ova implanted, with the result that some of the fetuses are resorbed in utero.

II. *Lactation.*—In a series of experiments the young from vitamin E-deficient rats were variously interchanged with those from normal females from the stock colony. The young from the vitamin E-deficient females were successfully reared when suckled by the normal females. The vitamin E-deficient mothers were not successful in rearing either their own young or those taken from normal mothers. Apparently this was not for lack of milk but rather because of some deficiency in the milk.

In the various experiments the young suckled by the vitamin E-deficient females developed a characteristic weakness of the hind legs on about the fifteenth day. If the animals lived the condition grew worse and the hind paws and even the front paws became contracted. The administration of small doses (0.06 cc.) of a vitamin E-rich oil to the young prevented the development of the condition if the administrations were given early enough. Also young suckled by normal mothers for 8 days and then transferred to the vitamin E-deficient mothers successfully completed the suckling period under these conditions. It was also shown that the performance of the vitamin E-deficient mothers could be improved somewhat by increasing the vitamin E dosage at the time of gestation above the level required to produce a living litter. These results all point to a deficiency, probably a vitamin E deficiency, in the milk of the vitamin E-deficient mother. The young are apparently normal at birth and under normal conditions obtain the amount of vitamin E they require from the mother's milk.

Possible avitaminosis K produced in mice by dietary means, R. MURPHY (*Science, 89 (1939), No. 2305, pp. 203, 204*).—A brief report is made of the bleeding tendency noted in white mice on an experimental diet being used in a study of the raw egg white syndrome. The diet consisted of powdered egg albumin 61 percent, cornstarch 27, brewers' yeast 5, salt mixture 4, cod-liver oil 2, and agar 1 percent. The average bleeding time for mice on this diet was 10.8 min. as compared with 4.9 min. for mice on the basal diet supplemented with an ether extract of alfalfa (equivalent to 5 percent of the diet), and with 4.6 min. for mice on the stock diet. The icteric condition also noted mice on the basal diet was not the cause of the bleeding, since the administration of the alfalfa extract ameliorated the latter condition without de-reasing the elimination of bile constituents. The efficacy of the alfalfa xtract in preventing the bleeding defect suggests that this symptom is associated with a vitamin K deficiency of the basal diet.

Studies of the essential unsaturated fatty acids in their relation to the t-deficiency disease of rats, E. M. HUME, L. C. A. NUNN, I. SMEDLEY-MACLEAN, d H. H. SMITH (*Biochem. Jour., 32 (1938), No. 12, pp. 2162–2177*).—The rincipal symptoms of the deficiency disease described by Burr and Burr (E. S. R., 3, p. 595) as affecting rats maintained on a complete diet devoid only of fat ere reproduced, and various materials were studied with regard to their ficacy in adequately supplementing the fat-free diet. The chemical methods for reparing the compounds tested and the biological tests are reported in detail.

Since weight increase is a nonspecific response, the authors consider that it should not be used as the only criterion in estimating the relative effectiveness of test materials, and that a cure of symptoms must be included as an indispensable part of the test. Dryness and scurfiness of the fore- and hind-paws occurred as a constant symptom and was adopted, therefore, as the most satisfactory criterion for studying the cure of skin symptoms, particularly since the insteps could be restored to normal within a reasonable period (35 days). Only three degrees of healing could be satisfactorily distinguished, however, and these were designated as ++ for complete restoration to normal, + for partial healing, and 0 for no healing.

In comparative tests methyl linoleate was found to be about 6 times as potent as methyl linolenate, and its beneficial effect lasted from 30 to 60 days after the test animals were returned to the unsupplemented deficient diet. Various oxidation products of linoleic and linolenic acids were tested. Of these, mixtures of α- and β- and of γ- and δ-tetrahydroxystearic acids in daily doses of 0.2 gm. were ineffective in promoting growth increase or healing skin lesions, and linusic and isolinusic acids (hexahydroxy derivatives of stearic acid) at the same dosage effected no healing but produced a slight increase in weight. The methyl ester of docosahexenoic acid isolated from cod-liver oil at daily doses of 0.06–0.1 gm. failed to benefit the skin lesions, but was very potent in promoting weight increase. It appears that the ability of unsaturated fatty acids to supplement a fat-free diet in promoting weight increase is not necessarily associated with ability to heal skin lesions. Chaulmoogra oil, chaulmoogric acid, methyl arachidate, and trihydroxystearic acid were entirely without effect in promoting growth response or healing. The potency of a fraction of the unsaturated acids from lard was compared with that of a similar fraction from linseed oil and was found to be about the same in promoting weight increase and in the healing of skin lesions. By both criteria raisin oil was found slightly more potent than linseed oil. The linoleic acid contents of these two materials and of the fractions of linseed oil and lard were not greatly dissimilar, but the linseed oil and its acids both contained 40–50 percent of linolenic acid in addition. These results, therefore, confirm the superior potency of linoleic to linolenic acid.

Occurrence, pathological aspects, and treatment of fluoride waters, M. S. Nichols. (Univ. Wis.). (*Amer. Jour. Pub. Health, 29 (1939), No. 9, pp. 991–998, figs. 3*).—This review gives a brief discussion of the distribution of fluoride waters, of the rock strata and sources from which they arise, and of the pathological aspects of their use as drinking waters. Methods for reducing the fluoride content of such waters and some of the practical difficulties involved are also treated briefly.

Mottled enamel in rat molars, G. J. Cox, M. C. Matuschak, S. F. Dixon, and W. E. Walker (*Science, 90 (1939), No. 2326, p. 83*).—Rats born and bred on a sucrose-casein type of ration were given graded doses of fluorine as sodium fluoride administered daily by pipette. The amounts given were 0, 1, 2, 4, 8, 16, 32, 64, 128, and 256 μg., the last to a single rat, the tenth in its litter. The rats were weaned at 21 days, carried for 8 weeks on a ration of yellow corn meal 66, whole milk powder 30, alfalfa powder 3, and sodium chloride 1, and then sacrificed. In the rat that had received as much as 256 μg. per dose, the first and second molars of both the maxillae and mandible showed dull white, deeply corroded enamel. Cusps of the upper molars were denuded. Two rats having received 128 μg. of fluorine daily showed diffuse milkiness of the enamel at the gingival line and some rounding of the cusp edges of the first two molars. Rats receiving less than 128 μg. of fluorine had normal molars.

The authors conclude that the rat, though less sensitive to fluorosis than man, can be used to study the interrelations between fluorosis and dental caries, since both of these conditions can be produced in it experimentally.

TEXTILES AND CLOTHING

Textile fibers: Chemical and physical aspects, J. ALEXANDER (*Indus. and Engin. Chem., 31 (1939), No. 5, pp. 630–642, figs. 13*).—A review and synthesis of modern research on textile fibers covering 54 references.

HOME MANAGEMENT AND EQUIPMENT

Family income and expenditures: Plains and Mountain Region.—I, Family income, G. S. WEISS, D. MONROE, and K. CRONISTER (*U. S. Dept. Agr., Misc. Pub. 345 (1939), pp. IV+330, figs. 13*).—This report, the second in the series, is based on a survey of the Plains and Mountain region, and presents information similar to that previously reported (E. S. R., 81, p. 603) for the Pacific Region.

MISCELLANEOUS

Forty-ninth Annual Report [of Arizona Station], 1938, R. S. HAWKINS (*Arizona Sta. Rpt. 1938, pp. 84, figs. 7*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue. Meteorological data are included.

Annual Report of [Nevada Station], 1938, S. B. DOTEN (*Nevada Sta. Rpt. 1938, pp. 44, figs. 4*).—Following questions and answers regarding the organization, relationships, functions, and policies of the station, experimental work for the most part noted elsewhere in this issue is briefly described.

Agricultural research in New Hampshire: Annual report of the director of New Hampshire Agricultural Experiment Station for the year 1938, J. C. KENDALL (*New Hampshire Sta. Bul. 313 (1939), pp. 34*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Fifty-ninth Annual Report of the New Jersey State Agricultural Experiment Station and the Fifty-first Annual Report of the New Jersey Agricultural College Experiment Station for the year ending June 30, 1938, J. G. LIPMAN (*New Jersey Stas. Rpt. 1938, pp. XXIV+135*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Colorado Farm Bulletin, [October–December 1939] (*Colo. Farm Bul. [Colorado Sta.], 1 (1939), No. 4, pp. 23, figs. 6*).—In addition to several articles noted elsewhere in this issue and the customary announcements and news notes, this number includes Southern and Foreign Produced Alfalfas Shown To Be Non-productive in Colorado, by R. M. Weihing and D. W. Robertson (pp. 4–6); Station Directing Efforts on Production of Seed Potatoes Free of Bacterial Wilt, by C. H. Metzger, D. P. Glick, and W. A. Kreutzer (pp. 15, 16); and Late Fall Is Favorable Time to Reseed Range, by W. O. Shepherd (pp. 17, 18).

Bimonthly Bulletin, [September 1939], edited by H. C. HANSON and W. C. PALMER (*North Dakota Sta. Bimo. Bul., 2 (1939), No. 1, pp. 31, figs. 6*).—In addition to several articles noted elsewhere in this issue, there are included The Scientific Method, by H. C. Hanson (p. 2), and the customary abstracts.

NOTES

Illinois University and Station.—Dr. John J. Pieper, associated with the agronomic work of the institution since 1917 and professor and chief in crop production since 1936, died November 26, 1939, while returning from the New Orleans Convention of the American Society of Agronomy. Born January 24, 1886, at Granite City, Ill., he was graduated from the College of Agriculture in 1916 and received the M. S. degree in the following year. Except for 1927, when he was on leave of absence completing his work for the doctor's degree at the University of Wisconsin, his service to the State had been continuous. He was the author or joint author of eight bulletins and circulars and numerous scientific articles on various agronomic subjects, notably crop production, pasture improvement, and weed control.

Indiana Station.—Dr. W. V. Lambert, a senior animal husbandman in the U. S. D. A. Bureau of Animal Industry, has been appointed associate director, effective February 1. Warren M. McVey has been appointed farm director as of January 1.

New York State Station.—Robert F. Holland, instructor in dairy industry at Cornell University, has been appointed associate in research (dairying) and has begun work on pasteurization standards as regards high temperature pasteurization of milk. LeRoy E. Everson has succeeded Dolores E. Weimer, resigned, as assistant in research in the division of seed investigation.

U. S. Department of Agriculture.—A press release of December 18, 1939, announces the establishment of the position of Assistant Director of Research "to facilitate the handling of the increased duties and responsibilities placed upon the Director of Research, in cooperation with the bureaus of the Department, for planning and coordinating the programs of the four new regional research laboratories now being constructed by the Department to develop new uses for farm commodities."

Dr. R. Y. Winters, a principal experiment station administrator in the Office of Experiment Stations, has been appointed to this position. In association with the Director of Research, he will work with the bureaus of the Department and their research staffs in the development and integration of the Department's research program for these laboratories with the research of other Federal, State, and private agencies. In carrying forward the program, to avoid duplication of effort and facilities and to provide for the most economical and effective means of achieving results, he will assist in working out cooperative arrangements and relationships between the new laboratories and the bureaus, the State agricultural experiment stations, and other agencies.

Eighth American Scientific Congress.—Announcement has been made of the scheduling of this congress in Washington, D. C., from May 10 to 18, 1940, under the auspices of the Government of the United States, with Under Secretary of State Sumner Welles as chairman and Dr. Alexander Wetmore, assistant secretary of the Smithsonian Institution, as secretary. The congress will be divided into 11 sections, among which are agriculture and conservation, biological sciences, and economics and sociology.

U. S. GOVERNMENT PRINTING OFFICE: 1940

EXPERIMENT STATION RECORD

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THE 1939 REPORT OF THE CHIEF OF THE OFFICE OF EXPERIMENT STATIONS

To meet the requirements of law and the needs of its constituency, the Office of Experiment Stations prepares two reports each year. One of these is the report to Congress on the work and expenditures of the State agricultural experiment stations and deals almost exclusively with the progress of these institutions, including the results of their work. The other is an administrative report of the Chief, submitted to the Secretary of Agriculture, on what the Office itself has been doing in carrying out its allotted functions.

The latest of the administrative reports, covering the fiscal year ended June 30, 1939, contains much that is of general interest. It shows, for example, that the Federal grants to the States, Alaska, Hawaii, and Puerto Rico for agricultural research at the State and Territorial stations, the administration of which is the immediate responsibility of the Office, amounted to $6,541,250 for this period and that an estimated supplementary income of $13,800,000 brought the income of the stations from all sources to well over $20,000,000. There were under investigation 3,021 projects financed wholly or in part from Federal funds, and the total number of projects supported from all sources was approximately 8,500.

More detailed mention is made of the program of the Puerto Rico Experiment Station, which is directly supervised by the Office and with its primary function the serving of national interests as a tropical outpost of the Department. Particular attention was given by the Office to coordinating the research of the station and other research of the Department in Puerto Rico with the work of the experiment station of the University of Puerto Rico at Rio Piedras, which deals chiefly with agricultural and rural-life problems of the island. The Federal Station in cooperation with bureaus of the Department has continued investigations of quinine production and rotenone-bearing plants; the propagation of the coca plant, looking toward a possible domestic supply of the drug cocaine; the control of important insect pests of sweet corn; investigations of climatic and soil conditions

best suited to vanilla production, and of curing methods for vanilla beans; studies of methods of extraction and chemistry of essential oils of locally known and also introduced plants; culture of tropical fruits and spice plants; and research on the possible improvement through the use of colchicine of economic plants adapted to growth conditions on the island. Evidence has continued to accumulate indicating that the island can serve advantageously as a winter breeding station for certain vegetable and field crops, thus supplementing and accelerating the breeding programs of the Department and the State experiment stations. The station has also been of considerable service to various islands of the Caribbean Sea and to countries in Central America and South America by making available to them shipments of beneficial insects and propagating material of certain crop plants. One of its outstanding contributions during the year has been the successful introduction of a cold- and drought-resistant strain of the Amazon fly, a parasite of the cane and corn top borer.

Another section of the report deals with the publications of the Office and its library and bibliographic service. Special mention is made of *Experiment Station Record*, "an epitome of progress and results of current scientific research carried on by the experiment stations, the Department, and other agencies for the improvement of agriculture and rural life." During the year "volumes 79 and 80 were completed, but, because of the increase in printing rates discussed in last year's report, 1 entire issue of 144 pages was omitted and 4 others were curtailed 16 pages each. . . . The total number of abstracts published in the 2 volumes was 6,746 (2,975 in volume 79 and 3,771 in volume 80), a decrease of 472, or 6.5 percent, from the previous year. With this decrease, the problem of adequately covering the literature in the space available, which the steady expansion of research agencies has been rendering increasingly difficult for several years, was correspondingly aggravated."

The bulk of the report is given over to a comparatively new development, the general administration of the Special Research Fund provided by the Bankhead-Jones Act of 1935. Responsibility for this administration is assigned to the Director of Research and Chief of the Office of Experiment Stations. In accordance with the terms of the authorizing act, 50 percent of the $1,400,000 appropriated for the fiscal year 1939 was available for research laboratories in the major agricultural regions, 48 percent for special research projects of the Department, and 2 percent for administration of the allotments of Bankhead-Jones funds granted to the States, Territories, and Puerto Rico for agricultural research.

Regional research laboratories authorized by the act have now been established at nine centers, each with a specific program of major

importance in the regions served. Of these laboratories, two were established in 1935, one in 1936, three in 1937, two in 1938, and one during 1939. All are cooperative with from 11 to 25 States, and are under the immediate direction of the appropriate subject matter bureau of the Department.

Notable progress is reported from the oldest of these laboratories, the vegetable-breeding laboratory near Charleston, S. C., which is attacking the problem of breeding varieties of vegetables better adapted to the climate and soil conditions faced by southern vegetable growers and home gardeners. The crops worked with so far include watermelons for wilt resistance, cold-hardy cabbage, sweet corn for resistance to corn earworm attack, peas, snap beans, and tomatoes. Since conditions vary quite widely within the 13 cooperating Southeastern States, the laboratory gives particular emphasis to determining the genetic principles underlying the inheritance of desired characteristics among the kinds of vegetables selected for study, and distributes stocks having these characteristics from which the State collaborators may select the strains that prove best adapted to their conditions.

The improvement through basic research of pastures in the 12 Northeastern States is the objective of the pasture-research laboratory at State College, Pa. The problem of self-sterility, which is an important one for certain grasses and clovers, received especial emphasis, and a genetic basis for this condition was determined. Successful crosses were made between plants of perennial ryegrass and meadow fescue. Colchicine treatments of perennial ryegrass, white clover, and red clover resulted in larger leaves and thicker culms, more highly soluble dry matter, and higher sugar content than in untreated plants. Progress was made in determining for several grasses the effect of cold treatments, variations in length of day, intensity of light, and nutrient concentrations on growth and composition.

In its work of developing industrial uses for soybeans and soybean products in cooperation with 12 North Central States, the soybean industrial products laboratory at Urbana, Ill., has prepared 237 samples of paints, varnishes, and enamels, for which weathering tests are under way. Conditions for the dispersion and precipitation of soybean proteins have been studied closely, and published results are finding immediate industrial use. The conclusions of a 3-year study of the effect of varieties and environment on chemical composition of soybeans when grown in different soil types indicate that the two factors are of about the same magnitude. Preliminary results obtained by backcrossing show that this method has promising possibilities for developing improved commercial varieties.

The major accomplishments at the regional laboratory at Ames, Iowa, for the improvement of swine through breeding were the establishment of new lines of breeding animals and the expansion of buildings and other facilities. This work is in cooperation with 12 stations. Herds are now established under active cooperation at the Iowa, Minnesota, Mississippi, Nebraska, and Oklahoma Stations, which include Poland China, Duroc-Jersey, Tamworth, and Danish Landrace breeds. Active cooperation was also initiated with the Illinois Station to test the effect of selection on the rate and economy of gain in two lines of Hampshires, one a rapid-gain line and the other a slow-gain line.

The breeding program of the regional laboratory at Dubois, Idaho, for the improvement of sheep for western ranges has been developed in cooperation with 12 Western States. Marked progress has been shown during its second year. Because of the importance of progeny tests, the 1939 program included 25 additional pens. The breeding program was further strengthened by the addition of laboratory equipment for wool studies.

In the research program of the animal-disease laboratory at Auburn, Ala., coccidia were found in nearly all young cattle that were examined regularly. No consistent relationships were found between the severity of parasitism and various soil types. Several species of nematodes survived 5 months on well-drained sandy pastures. Experimental infections in calves with *Haemonchus contortus* yielded data as to the effect of feeding on the expression of clinical symptoms. Encouraging results were obtained in efforts to find a satisfactory medium for the growth of the bacteria responsible for Johne's disease. Observations are in progress as to the reaction of guinea pigs and chicks to inoculations of this organism. The work on gastrointestinal parasites was expanded to include lungworms. The 12 cooperating experiment stations in the southeastern region are assisting the laboratory in obtaining material for the study.

The physical plant of the laboratory at East Lansing, Mich., for the improvement of viability in poultry has been completed, consisting of a central laboratory building, brooder houses, isolation houses, laying houses, and a garage and feed-storage house. The first hatch of experimental chicks was taken off April 3, 1939. Although the research program of the laboratory as accepted by the Department and the 25 cooperating stations in the north-central and northeastern regions was outlined to give consideration to the management and nutritional and pathological aspects of fowl paralysis, first attention is being given to the development of strains of poultry of known resistance to this disease. This work will include among other facts

the identification of strains of poultry with respect to resistance and susceptibility to fowl paralysis, the determination of the effectiveness of breeding for resistance and susceptibility, and the influence of egg production and other biological factors on the incidence of the disease.

The research program of the regional laboratory with headquarters at Riverside, Calif., for investigations of the salinity of irrigation waters is geared to the solution of important problems of large areas devoted to irrigation agriculture in the 12 cooperating Western States and Hawaii. The work is planned to contribute to basic knowledge concerning the tolerance of economic plants of the West to salts found in irrigation waters and soils of irrigated areas, the effect of continued irrigation on the physical nature of the soil and its productivity, the mechanism of salt injury, and the symptoms of injury resulting from excessive salt concentrations. The irrigation practices necessary to avoid harmful salt concentrations and the possibilities and limitations of drainage as a reclamation practice will receive consideration. The research greenhouses and other facilities, which supplement those of the Rubidoux Laboratory made available by the University of California for the use of the Department, were completed January 20, 1939. Concrete tanks to serve as sand-culture vessels for the growth of crops have been constructed at the main laboratory at Riverside and at the United States Date Garden, Indio, Calif. Other tanks are under construction at the United States Horticultural Station, La Jolla, Calif. These three stations, which represent decided ranges in climate from hot and dry to cold and humid, will afford opportunity for determining the effects of extremes of light, temperature, humidity, and transpiration on the crop plants selected for study.

Although sponsored primarily by the experiment stations of the Northeastern States, the scope of investigations of the laboratory for research into the relation of soils to plant, animal, and human nutrition is national rather than regional. Formal approval of a project in this field which had been worked out in cooperation with the directors of the 12 northeastern stations was given on January 31, 1939. Cornell University was selected as the location for the laboratory. A 2.25-acre site on the campus for laboratory buildings, greenhouses, and other facilities was deeded to the Federal Government by the university, which also supplied detailed plans and specifications for the wing of the main laboratory building now under construction and will supply, at no cost to the Department, rooms for small animals to be used in the experiments.

The portion of the Special Research Fund available for special research projects was intended primarily to enable the Secretary of Agriculture to undertake studies basic to agriculture in its broadest

aspects. The legislation provides that these research projects may be conducted by such agencies of the Department as the Secretary may designate or establish. One of the effective uses of the fund is to provide for an immediate study of problems which arise during the year, especially in connection with the administration of acts basic to the welfare of agriculture. Other major problems require for solution a more fundamental type of research extending over longer periods of time. Both these needs have been kept in mind as fas as practicable in the administration of the fund. The larger portion is assigned to the more fundamental studies, but each year a portion of the fund is assigned to research projects undertaken to collect much needed basic factual data in a relatively short time.

Within the 4 years during which the Special Research Fund has been available 74 separate research projects have been under investigation, and 31 of these had been completed or terminated by June 30, 1939. As types of the "short-time" studies are mentioned inquiries to develop a practical basis for the establishment of "all-risk" crop insurance, for storage of grain sorghum on the farm, and for preventing the quick deterioration of vegetable seeds in warm, humid climates. The longer-time projects discussed include the improvement of weather forecasting of both short-range and long-range character; a project as to grain storage on farms, in which three bureaus of the Department and seven stations are participating; research on the effects of light for different length periods upon growth and reproduction of plants; and an investigation of enzyme action at storage temperatures.

A final section of the report deals with coordination of research and brings out the fact that aside from a large amount of assistance rendered informally, the Office examined, approved, and recorded nearly 1,400 new or revised formal memoranda of understanding covering cooperative research between bureaus of the Department and the stations and involving over 1,000 major research undertakings. All of the State experiment stations and all but one of the research bureaus of the Department participated in this program of cooperative research. "While these net figures do not suggest a substantial increase in formal cooperation over the previous year, the numbers of new undertakings and of undertakings brought to successful completion during the year were higher than ever before."

The State experiment stations again worked with other State agencies and local organized groups, with each other in regional groups, and with the Department individually and in regional and national groups, in efforts to coordinate their research, especially on such adjustment and action program problems as land-use planning and adjustment. Over 50 specific phases of the national study of

adjustments in farming by regions and type-of-farming areas were continued in 26 States with the cooperation of the Agricultural Adjustment Administration, Bureau of Agricultural Economics, Farm Security Administration, and Soil Conservation Service. Similar work was completed in 9 other States, bringing the total of States which have completed this study to 22. Gradually this project is being supplanted by a cooperative program which will deal with agricultural adjustment, conservation, crop insurance, farm forestry, flood control, land retirement, rehabilitation, water utilization, and other factors that affect land use. By the end of the year 28 States had signed formal cooperative agreements covering this undertaking.

Research relationships with the Soil Conservation Service continued to be effective with 47 stations. Cereal crop improvement investigations again included 21 States, and cultural studies of potatoes 22. The cooperative soil survey was continued in 28 States and completed in 8. Other extensive cooperative projects included cotton investigations in 12 States, investigations in machinery for the mechanical application of fertilizers and weed control in 11, studies of concentrated fertilizers in 11, the conformation and anatomy of the dairy cow and parasites of the oriental fruit moth in 12 each, the western range survey in 14, and the estimate of farm population and its movement in 13. Among projects of special interest in home economics were the north-central cooperative projects on the nutritional status of college women, now in its fourth year, the regional project on ascorbic acid metabolism of college students in the Northwest, and the cooperative textile project in the Northeast on the wearing qualities of women's and children's apparel.

The total number of formal agreements covering all cooperative research ranged from 9 to 59 per station. It is evident from these figures that cooperation has long since passed the status of a theme for academic endorsement and has become an everyday method of attack on the major problems of the Nation. Under these circumstances there need be little apprehension of a needless duplication of effort, for there is every indication of concerted and sustained unity of action on essential matters.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical and bacteriological investigations at the New York State Station] (*New York State Sta. Rpt. 1939, pp. 15–17, 18, 19*).—Work is noted on fruit and vegetable juice studies and wines (partly coop. U. S. D. A.); the relation between chemical composition and maturity in grapes and other fruit and vegetable studies; and protein investigations dealing with the dissociation of gelatin and the effect of light on amino acids, proteins, and allied substances.

[Chemical investigations of the Oregon Station] (*Oregon Sta. Bul. 359 (1938), pp. 9, 10, 73, 74, fig. 1*).—This report notes the development of five new commercial prune products and an investigation to correlate high acidity and high pectin in small fruits with the production of commercially successful preserves (coop. U. S. D. A.).

Composition of the various parts of the oat plant at successive stages of growth, with special reference to the formation of lignin, M. PHILLIPS, M. J. GOSS, B. L. DAVIS, and H. STEVENS. (U. S. D. A. and Idaho Expt. Sta.). (*Jour. Agr. Res. [U. S.], 59 (1939), No. 5, pp. 319–366, figs. 9*).—The quantities of the more important constituents of the stalks and roots are presented on a percentage and on an absolute basis. The percentages and the absolute quantities of methoxyl in the original and in the extracted plant materials generally increased as the plant developed and matured. The Cross and Bevan cellulose, cellulose uronic acids, lignin, and methoxyl in the lignin increased as the plant grew to maturity. In the early stages of development, the methoxyl not in the lignin, expressed as percentage of the total firmly bound methoxyl, was rather high, but its percentage decreased as the plant matured. No evidence that the plant synthesized lignin from cellulose, pentosans, or pectin could be obtained.

It is suggested that lignin is synthesized by the plant directly either from glucose or from sucrose. Among the first steps in the synthesis of lignin is the production of a substance or substances having firmly bound methoxyl groups, which may be formed in the course of splitting up of carbohydrates by a process of hydrolysis, oxidation, reduction, and dehydration. It is pointed out that the observed presence of large quantities of substances containing firmly bound methoxyl groups and the gradual decrease of these substances with the increase in the content of lignin lends support to this hypothesis.

The decomposition of citric acid by Betacoccus cremoris, J. VAN BEYNUM and J. W. PETTE (*Jour. Dairy Res. [London], 10 (1939), No. 2, pp. 250–266, figs. 4*).—This contribution from the State Agricultural Experiment Station, Netherlands, describes the mechanism involved in the break-down of citric acid to C_4 compounds, acetic acid, and carbon dioxide in neutral and acid media. When pure cultures of *B. cremoris* were inoculated into neutral milk the fermentation products were acetic acid and carbonic acid. However, in acidified milk or in mixed cultures of this bacterium and lactic acid streptococci, the products were acetic acid, carbon dioxide, diacetyl, acetylmethyl carbinol, and 2,3-butylene glycol. The various steps in the decomposition process are described. Diacetyl

was formed only when oxidation with atmospheric oxygen took place, but carbinol was formed in both aerobic and anaerobic cultures. The higher the acidity of the medium the greater was the amount of C_4 compounds formed, while a reciprocal relation was found to exist between the quantities of acetic acid and the C_4 compounds. Diacetyl was not formed as an oxidation product of acetylmethyl carbinol, but apparently was formed when oxygen interacted during the aldehyde condensation reaction.

Coenzymes, C. A. Bauman and F. J. Stare. (Univ. Wis.). (*Physiol. Rev., 19 (1939), No. 3, pp. 353–388*).—The review deals primarily with the pyridine nucleotides, including cozymase, the diphosphopyridine nucleotide, and coferment, the triphosphopyridine nucleotide; with cocarboxylase, now identified as thiamin pyrophosphate; and with the coenzyme of the *d*-amino oxidase, also referred to as the prosthetic group of the *d*-amino acid oxidase. These three enzymes are discussed as to their nomenclature, occurrence, properties, method of determination, chemistry, and mode of action. Miscellaneous coenzymes are considered briefly, and the coenzyme concept and certain interesting relations are discussed. A very extensive bibliography is appended.

A collaborative investigation of the spectrophotometric method for assay of vitamin A, C. L. Barthen, F. F. Berg, E. B. Carter, D. M. Copley, R. J. Fosbinder, T. Lewis, and F. O. Taylor (*Jour. Amer. Pharm. Assoc., 28 (1939), No. 10, pp. 661–672*).—Six samples of fish liver oils and blends, varying in vitamin A potency (as determined by bio-assay) from 1,500 to 300,000 U. S. P. vitamin A units per gram and including a U. S. P. reference oil of 3,000 units per gram, were submitted to the various collaborators, representing 13 laboratories in which various instruments (such as the photoelectric photometer, photoelectric colorimeter, monochrometer, spectrophotometer, and vitameter) were employed. The results obtained are reported in detail and subjected to critical analysis. Averages of the equivalents (in U. S. P. units per gram) obtained for the respective specimens approximated the potencies indicated by the biological assays, although the results in 5 of the laboratories in one or more cases were found far out of line as compared with values of the other 8 laboratories. The average spread of results calculated as the deviation from the mean was 33.78 percent. By selecting only the results from the 8 laboratories in fair agreement and by applying corrected conversion factors, the average spread of results was reduced to 9.87 percent.

In summary it is pointed out that the conversion factor is of paramount importance and that for the greatest degree of accuracy in results the E. value of the U. S. P. reference oil (or its unsaponifiable fraction or any other suitable standard) should be determined every day and the conversion factor calculated to check the standard of conditions. "Under specified and well-controlled conditions of operation of the physical instruments, capable of accuracy of measurement, results can and should be obtained which are in closer agreement than those obtainable by biological assay."

Water-soluble B vitamins.—XI, The estimation of yeast eluate factor and yeast filtrate factor by rat growth methods, C. E. Edgar, M. M. el Sadr, and T. F. Macrae (*Biochem. Jour., 32 (1938), No. 12, pp. 2200–2206, fig. 1*).—Rat growth methods are described for the determination of yeast eluate factor (vitamin B_6 of György (E. S. R., 75, p. 283); factor 1 of Lepkovsky (E. S. R., 80, p. 239)) and yeast filtrate factor (factor 2 of Lepkovsky (E. S. R., 76, p. 839)). The procedure involves comparison of the growth rates of animals receiving the test material with those of negative and positive control animals, the latter receiving definite amounts of standard yeast eluate or yeast filtrate fractions. The methods of preparing these fractions and of preparing the rat litters for the test are

described. The unit of eluate activity adopted is based on the amount of standard eluate fraction equivalent to 2 gm. of dry yeast. The unit of filtrate factor activity is based on the potency of an amount of the standard filtrate fraction, purified by amyl alcohol extraction, equivalent to 2 gm. of dry yeast. In each case the amount, when given daily to a rat prepared as described, produces a growth response of approximately 90 percent of the maximum.

The determination of vitamin B_1 by means of the yeast test [trans. title], K. HEYNS (*Hoppe-Seyler's Ztschr. Physiol. Chem., 258 (1939), No. 5–6, pp. 219–237*).—Experience in the author's laboratory in the determination of vitamin B_1 by a slightly modified form of the yeast-test method described by Schultz, Atkin, and Frey (E. S. R., 79, p. 11) led to the conclusion that the method was useful and satisfactory if a suitable race of yeast was selected and care was taken in following the details of the procedure. Experiments were carried out to determine the effect of various additions to the test medium. Other experiments indicated that the increased CO_2 production effected by the stimulating action of the vitamin B_1 was attributable not to an increase in yeast growth but rather to an increase in the metabolic activity of the cells.

The determination of aneurin in small blood samples by the thiochrome procedure [trans. title], K. RITSERT (*Klin. Wchnschr., 18 (1939), No. 24, pp. 852–854*).—A rapid method for determining vitamin B_1 in only 1 cc. of whole blood without preliminary purification by adsorption is described in some detail. The method involves dilution of the blood, acidification with HCl, and precipitation of the protein with anhydrous sodium sulfate. Oxidation of the aneurin in the filtrate is then effected in alkaline solution with ferricyanide. The resultant thiochrome is taken up in isobutyl alcohol, the fluorescence under a Hanover quartz lamp being compared with that of a standard thiochrome solution corresponding to 1 mg. of aneurin. By this method the aneurin content of blood of normally nourished individuals was found to vary between 3γ and 15γ percent, these results being in good agreement with findings by other methods. With intravenous injection of the vitamin (30 mg. of "Betabion"), the aneurin content of the blood showed a rapid and pronounced increase, with subsequent rapid decline. Upon intramuscular injection, however, the increase in the blood concentration of the aneurin was much smaller, although definitely detectable. The results on laboratory animals (guinea pigs and sheep) were found to be similar to those obtained with humans.

The estimation of vitamin B_1 in blood, H. M. SINCLAIR (*Biochem. Jour., 32 (1938), No. 12, pp. 2185–2199, fig. 1*).—The method of Meiklejohn (E. S. R., 79, p. 11) is examined critically. Experiments are reported to show that the medium employed is not satisfactory for optimum growth of *Phycomyces blakesleeanus*, the fungus used, and that improvement can be effected by changing the concentration of asparagine (0.4 percent about optimal in the presence of blood), by changing the source of nitrogen (hydrolyzed casein was most satisfactory), and by the addition of small amounts of various salts. Other experiments are reported to show that the blood itself always contains a factor other than vitamin B_1 that facilitates the growth of the organism so that the addition of blood to small amounts of vitamin B_1 usually produces a greater growth than expected; moreover, large samples of blood (without added vitamin) usually give a growth even greater than that obtained with excess vitamin B_1. This adjuvant effect of blood is ascribed in part to its nitrogen and possibly its salt content, and in part to its buffering power, which lessens the inhibitory effect of the products of metabolism of the organism.

Since the vitamin of the blood is bound, its growth-stimulating effect is not felt until the vitamin is liberated by heating. Data reported show that the temperature of autoclaving the medium containing the blood must be very carefully controlled, however. Experiments on storage of the blood indicate that the vitamin content remains the same for about 6 days at −2° [C.]. If kept for more than 1 week at this temperature, the growth-promoting power usually increases, due to increase in the adjuvant factor. In addition, the method is known not to be specific for vitamin B_1. It is considered, therefore, that the Meiklejohn method does not provide a quantitative estimate of the true vitamin B_1 content of the blood, but that if the possible sources of error are controlled as far as possible, the method is valuable for comparing apparent vitamin B_1 in different samples of blood.

Potassium cyanide as an agent inhibiting the oxidation of vitamin C in vitro, I. S. Wright and E. MacLenathen (*Jour. Lab. and Clin. Med., 24 (1939), No. 8, p. 808*).—Following the method suggested by M. Pijoan and F. L. Klemperer to prevent oxidation of ascorbic acid, a series of over 50 blood specimens was run in two lots, one with cyanide (5 mg. of potassium cyanide and 10 mg. of potassium oxalate for every 6 or 7 cc. of blood) and the other without it. The cyanide slightly retarded, but did not prevent, oxidation of the ascorbic acid, and it is considered that the apparent protection against oxidation is so unpredictable as to be of no practical value.

A new color reaction of ascorbic acid (vitamin C) [trans. title], M. Paget and R. Berger (*Compt. Rend. Soc. Biol. [Paris], 129 (1938), No. 33, pp. 960, 961*).—The reaction depends upon the ready oxidation of ascorbic acid by potassium permanganate in a cold acid medium, with the formation of oxalic acid and *l*-threonic acid. The oxalic acid formed is subsequently detected through reduction to glyoxylic acid, followed by treatment with phenylhydrazine hydrochloride and final oxidation with potassium ferricyanide or hydrogen peroxide. The method is outlined as follows:

To 1 cc. of dilute (1:1,000) ascorbic acid add in the cold 1 cc. of 0.2 N sulfuric acid and 0.5 cc. of 3-percent potassium permanganate solution. Shake 1 min., let stand 30 sec., then decolorize with a drop of hydrogen peroxide (10 percent by volume). In the decolorized liquid place a strip of pure zinc and let stand 3 min., decant the solution into another test tube, add 2 drops of a 1-percent solution of phenylhydrazine hydrochloride, bring to a boil, then cool under the tap. Add 2 cc. of concentrated hydrochloric acid, then 2 drops of a 5-percent solution of potassium ferricyanide or 2 drops of hydrogen peroxide (10 percent by volume). A rose to red color develops, depending upon the concentration.

Standardization of 2,6-dichlorophenolindophenol: An improved method, M. H. Menaker and N. B. Guerrant. (Pa. State Col.). (*Indus. and Engin. Chem., Analyt. Ed., 10 (1938), No. 1, pp. 25, 26, fig. 1*).—The present method involves direct reaction of the dye solution with potassium iodide and titration of the liberated iodine against sodium thiosulfate. Fifteen cc. of the dye solution (35–70 mg. per 100 cc.) are pipetted into a 50-cc. Erlenmeyer flask, 0.5–1.0 gm. of potassium iodide and 0.5–1.0 cc. of dilute sulfuric acid (1:4) are added, and, after shaking to facilitate the oxidation of the potassium iodide, the liberated iodine is titrated with 0.01 N sodium thiosulfate, using the usual starch indicator. One cc. of the 0.01 N sodium thiosulfate is equivalent to 0.88 mg. of ascorbic acid.

The method is direct, the end point of the titration is sharp, and the sodium thiosulfate solution, the only standard reagent required, is stable after it has once reached equilibrium.

A new method for the standardization of the dye used for the determination of cevitamic acid (vitamin C), R. E. Buck and W. S. Ritchie. (Mass. State Col.). (*Indus. and Engin. Chem., Analyt. Ed., 10 (1938), No. 1, p. 26*).—A brief abstract is given of a method based upon the fact that 2,6-dichlorophenolindophenol will quantitatively oxidize iodide to iodine. The liberated iodine is determined by titration with standard sodium thiosulfate.

The determination of nicotinamide in blood [trans. title], A. Querido, A. Lwoff, and C. Lataste (*Compt. Rend. Soc. Biol.* [*Paris*], *130* (*1939*), *No. 14, pp. 1580-1584, fig. 1*).—The method described is based upon the fact that nicotinamide (or nicotinic acid) is required by the organism *Proteus* for growth. Sterile defibrinated hemolyzed blood in suitable dilution is added to the culture medium, which is then inoculated. The amount of growth in a given incubation period is measured by determining the optical density of the culture (using the electrophotometer of Meunier) and making allowance for the blanks determined on the culture medium with and without the blood. At concentrations appropriate to give density readings between 32 and 40 on the scale used, the readings on the blood sample may be compared directly with those obtained with a comparison solution of nicotinamide. With normal bloods a dilution of about 1 : 600 suffices to give this appropriate concentration of the nicotinic acid contained. As determined by this method, the nicotinamide content of the blood of nine human subjects was found to average 0.74 mg. per 100 cc., varying from 0.62 to 0.89 mg.

Photographing line tests in vitamin D assays, M. W. Taylor, D. Klein, and W. C. Russell. (N. J. Expt. Stas. and Rutgers Univ.). (*Indus. and Engin. Chem., Analyt. Ed., 10 (1938), No. 1, pp. 26–28, figs. 3*).—The technic of staining and photographing rat bones for records of Vitamin D assays is described, special attention being given to the details of fixing and staining the bones, photographic equipment, arranging the bones for photographing, lighting, and photographic technic. "The apparatus and technic employed allow the photographing of as many as 80 single rat radii on a 12.5×17.5 cm. (5×7 in.) film at 2×magnification."

Evaluation of oxalate solutions for the determination of packed cell volume in human blood, J. M. Leichsenring, E. G. Donelson, L. M. Wall, and M. A. Ohlson. (Minn. and Iowa Expt. Stas.). (*Jour. Lab. and Clin. Med., 25 (1939), No. 1, pp. 35–44*).—This joint study of the effects of kind and concentration of the anticoagulant used in packed blood cell volume measurements by the Van Allen hematocrit method was made in connection with the investigation of formed elements of the blood, a part of the cooperative project of the North Central States on the nutritional status of college women. The subjects consisted of a large group of college women (17–25 yr.), with a smaller group of older women (25–50 yr.) included for the purpose of observing possible differences in the tonicity of the blood with advancing age. The anticoagulants tested were potassium oxalate in 1.6 and 1.8 percent concentrations and sodium oxalate in 1.2 percent concentration. Heparin was checked as a control anticoagulant by comparing hematocrit readings of samples of blood with no anticoagulant, heparin, and the salts mentioned.

The observed mean differences in hematocrit values of heparinized and oxalated samples from those in which no anticoagulant was used amounted to −0.22 percent for heparin, +2.70 percent for 1.6 percent potassium oxalate, −2.43 percent for 1.8 percent potassium oxalate, and +1.42 percent for 1.2 percent sodium oxalate. The differences were significant for all but the heparinized sample. Variations between duplicate determinations on the same sample were also less for the heparinized samples and those with no anticoagulant than

for the oxalate samples. Of the latter the variation with 1.8 percent potassium oxalate most nearly approached that of the heparinized sample, followed by 1.6 percent potassium oxalate, and then by 1.2 percent sodium oxalate. Analysis of variance of the results with several anticoagulants demonstrated a highly significant difference among the means of the packed cell volume values with the different oxalate solutions, and among the means for the different individuals.

Preliminary oven-drying of the salts was shown to be essential in the preparation of the oxalate solutions except from previously unopened bottles. Of the various concentrations of oxalate tested, 1.6 percent potassium oxalate prepared from the dried salt proved to be most nearly isotonic with human blood. The 1.4 percent potassium oxalate and the 1.2 percent sodium oxalate were significantly hypotonic and the 1.8 percent potassium oxalate significantly hypertonic. The differences from heparin for the oxalate solutions were of like magnitude for the same subjects under basal and nonbasal conditions, and no differences in tonicity of the blood with age were apparent.

A practical method of determining color in fresh and frozen egg yolks, A. W. Turner and V. Conquest (*U. S. Egg and Poultry Mag., 45 (1939), No. 11, pp. 668–670*).—The method described consists in extracting 5 gm. of egg yolk with 95 cc. of C. P. acetone, filtering, and matching the filtrate with suitable color standards.

The colorimetric estimation of diacetyl and acetoin in dairy products, G. A. Cox and W. J. Wiley (*Jour. Council Sci. and Indus. Res. [Austral.], 12 (1939), No. 3, pp. 227–231*).—This contribution from the Dairy Research Institute, New Zealand, describes a modified colorimetric method of estimating diacetyl or diacetyl plus acetoin in dairy products. This method was found to be reasonably accurate and to possess certain advantages over the nickel dimethyl-glyoxime method.

Fruit and vegetable juices, D. K. Tressler, M. A. Joslyn, and G. L. Marsh (*New York: Avi Pub. Co., 1939, pp. XII+549, figs. 80*).—Commercial processes in the preparation, packing, and preservation of most of the common fruit and vegetable juices are dealt with, together with the important types of industrial equipment and plant lay-out. In addition to all available published information, the authors have had access to the files of the chemistry division of the New York State Experiment Station and to those of the fruit products laboratory of the University of California. The contents deal with the rise of the fruit and vegetable juice industry, principles of preparation and preservation of fruit juices, equipment used in preparing, packing, and preserving fruit and vegetable juices, plant lay-out, methods and equipment employed in freezing fruit juices, apple juice or cider, pineapple juice, grapefruit juice, orange juice, lemon and other citrus juices, the manufacture and preservation of grape juice, cherry and berry juices, miscellaneous fruit juices and fruit-juice beverages, tomato juice, sauerkraut juice and other miscellaneous vegetable juices, the nutritive value of fruit and vegetable juices, fruit juice concentrates and sirups, fruit-juice beverages, the utilization and disposal of fruit wastes, and blending formulas and sirup algebra, together with an appendix concerned with Federal and State regulatory acts, their interpretation and enforcement, and a general index, index of advertisers, and buyers' directory.

Exclusion of lead from maple products (*Vermont Sta. Bul. 452 (1939), pp. 20–22*).—Data based on the analysis of 102 samples each of maple sap and sirup as to their lead contamination are summarized and discussed.

AGRICULTURAL METEOROLOGY

Some contributions of radio to other sciences, J. H. Dellinger (*Jour. Franklin Inst.*, *228* (*1939*), *No. 1*, *pp. 11–42*, *figs. 15*).—This is an address reviewing critically the manner in which radio is contributing to progress in the sciences of weather, terrestrial magnetism, solar physics, and astronomy. In both its scientific aspects and practical applications meteorology has been markedly advanced through the use of radio apparatus and methods.

Certain statistical relationships bearing on the preparation of five-day weather forecasts in the United States, H. C. Willett (*Bul. Amer. Met. Soc.*, *20* (*1939*), *No. 8*, *pp. 329–331*).—An address in which the author indicates "in a preliminary manner some of the leads which we have tried to follow, and the tentative conclusions reached in our attempt to formulate a basis for the preparation of 5-day weather forecasts at [Massachusetts Institute of Technology]."

Trends in the development of flood forecasting, M. Bernard. (U. S. D. A.). (*Bul. Amer. Met. Soc.*, *20* (*1939*), *No. 8*, *pp. 336, 337*).

Long time forecasts of Ohio River floods, E. L. Moseley (*Ohio Jour. Sci.*, *39* (*1939*), *No. 4*, *pp. 220–231*, *pl. 1*).—Though heavy precipitation is a major factor, the amount of destruction wrought by a flood is said to depend on many factors besides the amount of rain at the time. The author's studies of tree rings appear to afford theoretical grounds for the idea that precipitation in any given region in the part of North America studied comes in ±90-yr. cycles. That there actually is a repetition of drought and flood after such lapses is said to be indicated by the records of Great Lakes levels, tree rings, high and low water in rivers, and actual rainfall. Tree-ring data in the region from southern Michigan to Tennessee are tabulated and discussed, and the records of actual floods are presented, leading to the conclusion that nearly all great floods of the Ohio River have occurred in the first third of the year. Excessive precipitation 90.4 yr. later falls in summer. Nevertheless, floods early in the year are likely to recur after 90–91 yr., since precipitation is often high not only at the time of the flood but also in the summers preceding and following. Wet years, like the floods themselves, show a tendency to occur in groups. Based on the data given, certain prophesies regarding high water in the river between the present time and 1946 are presented.

Wet thermojunctions for measuring relative humidity, L. A. Richards. (Iowa State Col.). (*Iowa Acad. Sci. Proc.*, *45* (*1938*), *pp. 175–178*, *fig. 1*).—"To obtain moisture sorption isotherms for soils and other hygroscopic materials, it is desirable to be able to measure relative humidity with considerable precision in the neighborhood of saturation. The whole range of soil moisture contents permitting plant growth, i. e., from saturation to the wilting point, corresponds to a change in the relative humidity of only 1.18 percent. This paper is a preliminary report of methods for making thermojunctions suitable for precise relative humidity measurements."

A diagram for obtaining in a simple manner different humidity elements and its use in daily synoptic work, W. Bleeker (*Bul. Amer. Met. Soc.*, *20* (*1939*), *No. 8*, *pp. 325–329*, *fig. 1*).—The construction of the diagram, with definitions and symbols, is described. The determination of humidity elements from ventilated thermometers at approximately sea level is discussed, together with some theoretical considerations and the application of the diagram for night frost and radiation fog forecasting.

A pocket thermohygrograph as an aid to bioclimatic investigation [trans. title], L. Weickmann (*Ber. Verhandl. Sächs. Akad. Wiss. Leipzig*,

Math.-Phys. Kl., 90 (1938), No. 1, pp. 47–54, figs. 4).—The apparatus is described and illustrated in detail, with its applications.

The sources of energy of storms, C. W. B. NORMAND (*Indian Sci. Cong. Proc.* [*Calcutta*], 25 (1938), pp. 29–47, figs. 4).—The general theme of this address concerns the thermodynamical approach to the study of storms of all kinds and deals with instability from vertical decrease of entropy, from horizontal change of temperature, and that due to water vapor; quantitative estimates of available energy; energy from latent instability; and final discussions of thunderstorms and duststorms and of cyclones.

Storm wave data for the New England hurricane of September 21, 1938, F. NEUMAN (*Bul. Amer. Met. Soc.*, 20 (1939), No. 8, pp. 357, 358).

Summary of weather and disease situations in Massachusetts in 1939, O. C. BOYD (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr.*, 23 (1939), No. 21, pp. 343–346).—This report includes data on precipitation, temperature, and dates of infection periods from April to September, inclusive, and a summary of the disease situation for the State.

A quantitative study of true-prairie vegetation after three years of extreme drought, J. H. ROBERTSON. (Univ. Nebr.). (*Ecol. Monog.*, 9 (1939), No. 4, pp. 431–492, figs. 32).—Studies of 100 permanent list plats, together with estimates of abundance of all species in randomly selected temporary plats on nine annually mowed, but ungrazed, prairies (1936–37), indicated a reduced abundance in perennial grasses of 22 percent and in perennial forbs of 10 percent. Annual forbs, ruderals, and grasses were 3–6 times more abundant in 1937 than in 1936, the hottest and driest year ever recorded in eastern Nebraska. Detailed data are given for the various groups and individual species. The general height of vegetation was greater in 1937 in response to a moisture supply more nearly normal than in 1936, and no dwarfing occurred attributable to drought injury of the preceding year. Slope exposure markedly influenced the behavior toward drought. Perennial grasses were more dense and suffered less injury on mesic than on xeric slopes or on the level. Long-lived forbs were most dense and most injured on the level, but gained 10 percent on xeric slopes. Factors other than slope exposure modifying the drought effects were deposition of drifting soil and alluvium, burning, hail, grasshoppers, and variations in previous dates of mowing and in soil permeability to water. The widest range in soil moisture content was found in big bluestem grass, while soil occupied by blue grama had a lower average content and narrower range. No consistent relationship was found between any kind of alterne and the chloride or carbonate contents, or the pH of the soil underlying it, but the rate of water infiltration into the soil in certain types of vegetation was characteristic. Steel cylinders 4 in. in diameter were pressed 14 in. into the soil and 4 in. of water were added, one at a time, to the inch of cylinder remaining above the surface. Big bluestem soil absorbed most readily and the soil occupied by wheatgrass least rapidly of the 12 types measured. Large taproots did not differ from fine, fibrous ones in their influence on the infiltration rate when the damming action of the vegetation was barred.

The influence of precipitation upon the width of annual rings of certain timber trees, F. X. SCHUMACHER and B. B. DAY. (U. S. D. A. et al.). (*Ecol. Monog.*, 9 (1939), No. 4, pp. 387–429, figs. 16).—To investigate meteorological effects on annual ring width it is necessary that the total variation among ring widths of a number of sample trees be arranged according to the sequence of years for which data are at hand, so as to segregate statistically homogeneous material for studying meteorological effects. This process is part of an analysis through which the total variation is divided into parts whose

causes or groups of causes are assignable. Annual variation is made up of statistically homogeneous material common to trees of the dominant stand, and is due mostly to climatic fluctuations. The data here presented are from two groups of white oak from western North Carolina, three of longleaf pine from Florida, two of shortleaf pine from northern Virginia, and a group of hemlock from New Hampshire. Of the total sum of squares among the annual ring widths of the separate groups, only 3–12 percent was in common annual variation ascribable to climatic fluctuations. The need of isolating these relatively small portions from the totals for evaluating the effect of the single element, precipitation, is obvious. The method used was that of regression analysis, which permitted the division of that section of annual ring variation due wholly to precipitation into two parts, viz, that due to average monthly precipitation regardless of its distribution over the 15-mo. period and that due to its distribution. The longleaf pine from Gainesville, Fla., one group of shortleaf pine from Virginia, and the hemlock were not significantly affected either by average monthly precipitation or by its distribution. The longleaf pine from Lake City and Jacksonville, Fla., and the second group of shortleaf pine from Virginia depended on the amount of precipitation, but not significantly on its distribution, for added width of annual ring. The oak data from North Carolina showed sensitivity to both factors. Using tables of orthogonal functions, the regression equation of each group is made to express the average effect of an added inch of precipitation per month during the 15-mo. period on width of annual ring. These are graphically presented.

Orange leaf transpiration under orchard conditions.—I, Soil moisture content high: A bioclimatic study, H. R. Oppenheimer and K. Mendel (*Jewish Agency Palestine Agr. Res. Sta., Rehovot, Bul. 25 (1939), pp. 82, figs. 24*).—Transpiration losses were found to increase steeply after sunrise, in most cases reaching a first peak 3–4 hr. later. These values fluctuate around noon, and later a decided drop toward zero sets in 3–4 hr. before sunset. Night transpiration is very small. Maximum values in the various seasons were found to show a strong dependence on climatic conditions. Transpiration losses on sirocco days were not much higher than those corresponding to the general conditions of the seasons, while evaporation during the day on such days was about 60 percent higher than normal.

The observations, reported in detail (with methods), are believed to demonstrate a remarkably effective regulative capacity of the orange leaf and to explain the fact that this fruit tree can be cultivated under the atmospheric conditions of a semiarid climate. Stomatal regulation plays a paramount part in the mechanism of restriction of excessive water losses. Analyses of fluctuations in daily transpiration curves indicated that light intensity, insolation, and air humidity strongly influence the march of the process, while wind velocity is less significant. The stomatal regulations, governed by light and by the water balance of the leaves, are in most cases responsible for deviations of transpiration from the course of the evaporation curve, occurring mostly during the hot part of the day. There are 81 literature references.

Amount of underground plant materials in different grassland climates, S. B. Shively and J. E. Weaver. ([*Nebr. Univ.*], *Nebr. Conserv. Bul. 21 (1939), pp. [4]+68, figs. 33*).—This ecological monograph concerns the three types of prairie constituting the great midcontinental area of grasslands extending from the highlands of central Mexico across the United States and northward into Canada, viz, tall-grass prairie in parts with the most favorable water relations, true prairie over much of the eastern part, and mixed prairie westward.

Grasses well adapted by structure and growth habit to withstand grazing form the bulk of prairie vegetation, 8–12 species often dominating, with 40–50 more of secondary importance and many others occurring. Forbs are also abundant, composites and legumes ranking highest in importance. Four distinct aspects resulting from the seasonal activities of different groups of forbs are presented during the growing season, viz, prevernal, vernal, estival, and autumnal. The vegetation consists of three levels above ground as a response to the struggle for light, and likewise a layering below ground permits prairie plants to absorb at different soil levels. The great stability of prairie, resulting in part from the long life span of many species, denotes a high degree of equilibrium between vegetation, soil, and climate. Vegetation also exerts numerous reactions on the water system, chief among which are the interception of rainfall, prevention of run-off, and removal of water by absorption and transpiration. An intensive study was made of the underground plant materials in relation to climatic conditions in five groups of stations in the regions in which the mean annual precipitation decreased from east to west from 33 to 29 to 26 in. in true prairie and to 23 and 17 in. in mixed prairie. Statistical treatment of the data obtained showed very significant correlations of volume with weight of underground plant materials and of average dry weight with mean annual precipitation. Determinations of organic matter and nitrogen in the surface 4 in. of soil at four stations in each of the five areas indicated that the average percentage of organic matter decreases from east to west, statistical treatment of the data showing that the mean for each area is significantly different from that of any other area. The results are discussed in detail, and a bibliography of about 1½ pages is included.

Pollen spectrum studies on the Anoka Sand Plain in Minnesota, R. C. ARTIST. (Univ. Minn.). (*Ecol. Monog., 9 (1939), No. 4, pp. 493–535, figs. 16*).—Following a historical review and a summary of the geology of the region, the author takes up the location of the bogs studied, the methods used, and the detailed results of comparisons of pollen spectra in profiles beginning with dominance of *Abies* and *Picea* and in those beginning with dominance of *Pinus* and *Quercus*. The final discussion deals with the vegetational and climatic history as disclosed by the bogs with complete and those with incomplete records. The overwhelming abundance of *Abies* and *Picea* followed by their practical disappearance is given as the most significant event recorded in the spectra and indicating a major climatic change. These studies are believed to indicate that the group method gives more reliable data than the single-bog plan, unavoidable in reconnaissance study, in that it avoids to a reasonable degree the danger of basing conclusions on exceptional cases.

SOILS—FERTILIZERS

[Soil inventigations at the New York State Station] (*New York State Sta. Rpt. 1939, pp. 32, 33*).—These have included studies on orchard soil management, and on soil conservation (coop. U. S. D. A.).

[Soil investigations by the Oregon Station]. (Partly coop. U. S. D. A. et al.). (*Oregon Sta. Bul. 359 (1938), pp. 93, 94, 105–110, 113, 114, figs. 5*).—These have included work on assimilation of arsenic, lead, and copper in spray residues by forage and vegetable crops; field fertilizer, barnyard manure, liming, and rotation experiments; sulfur and potassium in relation to soils and plants; organic matter in relation to solubility of minerals; iodine, boron, manganese, and tin in relation to soil fertility; investigation of microbial decomposition of organic matter in certain Oregon soils; lowering production costs by use of fer-

tilizers; soil conservation by crested wheatgrass forage crops; cover cropping to conserve soil and fertility; crop-residue experiments; sandy-soil erosion control; and drainage and improvement of wet or alkaline soils.

[Soil investigations by the Pennsylvania Station] (*Pennsylvania Sta. Bul. 382 (1939), pp. 22–26, 54, 55*).—The report contains notes by various authors on the following topics: Field test of different carriers of phosphorus, by C. F. Noll; value of crops on Volusia and De Kalb soils, effect of land drainage on Volusia soil on yield of wheat, nitrogen fixation, and nitrogen and organic matter, all by J. W. White; "quick tests" for soils, by F. G. Merkle; soil erosion, by N. F. Farris; and the mineralogy of Pennsylvania soils, by C. D. Jeffries.

[Soil investigations by the Vermont Station] (*Vermont Sta. Bul. 452 (1939), pp. 13–15*).—This report briefly summarizes work on effect of lime on the nitrogen content of cow manure, soil erosion on permanent pastures, value of sodium borate in pasture improvement, and boron fixation.

Soils of Musselshell County: Soil reconnaissance of Montana—Preliminary report, L. F. GIESEKER. (Coop. U. S. D. A.). (*Montana Sta. Bul. 374 (1939), pp. 51, fig. 1, maps 5*).—This report covers a further 1,913 sq. miles in the State reconnaissance survey previously noted (E. S. R., 80, p. 158).

Soil survey of Grafton County, New Hampshire, W. J. LATIMER ET AL. (Coop. N. H. Expt. Sta.). (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpt.], Ser. 1935, No. 6, pp. 79, pls. 2, figs. 2, maps 2*).

Variations in the composition of feldspar from a Hagerstown soil profile, C. D. JEFFRIES and J. W. WHITE. (Pa. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 3 (1938), pp. 26–31, figs. 3*).—The authors investigated the feldspar of very fine sand separates of eight horizons of a virgin Hagerstown soil profile and the dolomite upon which this soil profile has been developed. The feldspar which occurs in the parent dolomite is chiefly microcline with some weathered orthoclase. The orthoclase does not appear above the first 20 in. immediately above the rock and has been eliminated by weathering processes which appear to be similar to kaolinization. Above the first horizon adjacent to the parent rock the feldspar is microcline, which, in some cases, is coated with a layer of material similar to a plagioclase, as shown by microchemical tests. Weathering processes appear to be removing calcium from this material as the surface is approached. Above the B horizon, sodium seems to be replacing calcium in a manner similar to the replacement of sodium by calcium in the plagioclase series of feldspars. The microcline appears to have been weathered very little in the whole soil profile.

Reclamation of saline (alkali) soil in the Yakima Valley, Washington, C. A. LARSON. (Coop. U. S. D. A.). (*Washington Sta. Bul. 376 (1939), pp. 39, figs. 8*).—The tract of saline land studied was at one time highly productive, but its productivity had been impaired by high ground water and salt accumulation and it was finally abandoned in 1930. When the reclamation here reported was begun, in the spring of 1937, the concentration of salts in the soil was high, the soil to the depth of 3 ft. showing a mean specific conductance of 662 while the conductance of the surface 3 in. was 824, whereas 200 is approximately the upper limit for normal crop growth.

Copious irrigations of from 4 to 6.73 ft. on 5 plats during 1937 reduced the soil conductance in the 3-ft. profile to 133 by November 1937. The plats were seeded to sugar beets in 1938 when the mean profile conductance was found to be 144. The depth of the water applied in 1938 was from 3.6 to 6 ft., and the mean yield of beets was 24.2 tons per acre.

Ground-water mean elevation below the ground surface in 1937 and 1938 was 4.64 and 5.65 ft., respectively. The heavy irrigation raised the ground water

only temporarily. The mean monthly salt concentration of the ground water for the 5 irrigated plats expressed as conductance was 1,639 in April, 616 in September, and 1,002 in December 1937. In 1938 the conductance was 1,799 in June, 193 in September, and 901 in November. The outstanding characteristic of the salts in the soil and ground water was found to be an exceptionally high nitrate content. In March 1937 nitrate constituted 55 percent of the anions in the soil profile to the depth of 3 ft. The nitrate in the ground water as represented by 5 observation wells ranged from 21.8 to 63.3 percent of the anions. Unusual amounts of nitrate found in drains in other parts of the district indicate that other similar lands contribute nitrate to the drains.

No conclusive difference in efficiency of salt removal was found between double disking or plowing after burning weeds and plowing under the weeds. The seedbed on saline soil was prepared by leveling the land, placing the corrugations 18 in. apart, and irrigating copiously. For the succeeding irrigation the corrugations were placed between the previous ones. The excess salts were found to move downward into the subsoil water as a result of abundant irrigation. Corrugation at 3-ft. intervals without other cultural practices and copious irrigation during the season was found effective in removing excess soluble salts. Two-thirds of the soluble salts were removed from the surface foot by 2 irrigations when the corrugations were made between the previous ones.

Farm manure, R. M. Salter and C. J. Schollenberger (*Ohio Sta. Bul. 605 (1939), pp.[1]+69, figs. 4*).—This is a detailed discussion of all phases of the subject, accompanied by a bibliography of 118 citations. The contents deal with the manure production process, litter, the rotting of manure, losses from manure, use of chemical preservatives, fresh v. rotted manure, practical methods of handling, European storage practice, field management, composition, quantity of manure produced, fertilizing properties, manuring for crop production, manuring the crop rotation, effect of manure on feeding value and quality of crops, effects of manure upon the soil, objectionable features of manure, manure as an economic asset on the farm, and manure in a complete fertility system.

Foliar diagnosis: The influence of the soil on the action of fertilizers, W. Thomas and W. B. Mack. (Pa. Expt. Sta.). (*Plant Physiol., 14 (1939), No. 1, pp. 75–92, figs. 12*).—Other papers of this series have been noted (E. S. R., 79, p. 23; 80, p. 27).

When the soils of two similarly treated plats were relatively homogeneous, showing similar development and yields of the plants growing on them, duplicate pairs were represented by similar foliar diagnosis. On the other hand, when the soils of two similarly treated plats were not uniform, as indicated by widely different development and yields, they were represented by widely dissimilar foliar diagnosis. The nutritional factors producing the differences in yields between duplicate pairs were determined easily by the method.

Use of commercial fertilizers, G. S. Fraps and T. L. Ogier (*Texas Sta. Cir. 85 (1939), pp. 15*).—This circular presents as a separate publication suggestions for the use of commercial fertilizers which have been given from time to time in the annual fertilizer bulletin. The grades recommended are those which have been adopted for use in Texas for 1939–40.

Liming western Oregon soils, R. E. Stephenson and W. L. Powers (*Oregon Sta. Cir. 132 (1939), pp. 21, figs. 6*).—This circular summarizes a part of the results of 20 yr. of plat and farm liming experiments and soil acidity surveys.

In general, response to liming on recent river-bottom soils was found to be slight, on old valley-filling soils medium, and on "red-hill" lands marked. Use of lime on acid soils of humid regions, especially for legumes, is regarded as fundamentally sound. Lime not only neutralized the soil but also improved

tilth and water capacity, promoted growth of desirable soil micro-organisms, rendered more plant nutrients available, and increased yields, especially of legumes. It is also noted that lime is leached from western Oregon soils at the rate of from 200 to 300 lb. or more a year and that a 5-ton crop of alfalfa removes between 300 and 500 lb. The calculation of relative costs of various forms of lime and the conditions and rates for its best application are also discussed.

Commercial fertilizers, H. R. KRAYBILL ET AL. (*Indiana Sta. Cir. 250 (1939), pp. 80, fig. 1*).—The regulatory analysis data concerning the 1938 fertilizer materials are accompanied by definitions of terms, information on interpretation of analysis data for fertilizers and liming materials, and related information.

Analyses of commercial fertilizers, H. E. CURTIS, H. R. ALLEN, and L. GAULT (*Kentucky Sta. Regulat. Ser. Bul. 18 (1939), pp. 67*).—This is the usual annual report of fertilizer analysis data and related information.

[Fertilizer tests in Mississippi] (*Miss. Farm Res. [Mississippi Sta.], 2 (1939), No. 10, p. 4*).—A brief popular report on fertilizer experiments indicates some local fertilizer requirements and points out that more than 90 percent of the fertilizer now sold in the State is formulated in accordance with recommendations of the station.

Commercial fertilizers, L. S. WALKER, E. F. BOYCE, and L. E. DAVIS (*Vermont Sta. Bul. 453 (1939), pp. 29*).—Reporting the analytical results of the 1939 inspection, this bulletin notes also an increase in the use of commercial fertilizers over that of any previous year, reports on the acidifying or nonacidifying character of the brands examined, and notes that 526 tons of limestone would be required to neutralize the acidity developed by the 7,821 tons of complete fertilizer which were sold for application to Vermont soils.

AGRICULTURAL BOTANY

Abstracts of the papers presented before the Pacific Section of the Botanical Society of America, Stanford University, California, June 26 to 30, 1939 (*Amer. Jour. Bot., 26 (1939), No. 8, pp. 671, 672, 673, 674, 675, 676*).—The following are of interest to agricultural botany: Studies of the Development of the Carrot Root, by K. Esau, and Development of the Flower of *Antirrhinum majus* L., by S. E. Keeton (both Univ. Calif.); Germination and Seedling Development of Certain Desert Perennials, by T. D. Mallery; Induction of Polyploidy and Sterility in Amphidiploids Induced by Hetero-Auxin Treatment, by W. H. Greenleaf (Univ. Calif.); Mycology in the Service of Mankind, by E. P. Meinecke, and Some Recent Contributions of Plant Ecology to Human Welfare, by H. L. Shantz (both U. S. D. A.); The Effect of Anaerobic Conditions on Mitosis in Seedlings of *Hordeum*, by G. L. Stebbins, Jr., and L. Steinitz (Univ. Calif.); The Use of an Alternating "Translongitome" in Making and Interpreting Serial Sections, by D. M. Crooks (Univ. Ariz.); A Plant Growth Inhibitor and Plant Growth Inhibition, by W. S. Stewart; Effect of Shade on Flowering of Sugar Beets, by E. Carsner (U. S. D. A.); Opportunities for Research in Mycology in California, by L. Bonar (Univ. Calif.); and Plants of the Southwest Offering Opportunity for Botanical Research, by D. M. Crooks (Univ. Ariz.).

[Papers presented at the meeting (November 30 to December 4, 1937) of the Soil Science Society of America] (*Soil Sci. Soc. Amer. Proc., 2 (1937), pp. 251–257, 269, 279–288, 305–332, 367–374, figs. 21*).—The following papers of interest to agricultural botany are included: Further Studies of Some Factors Affecting the Preparation and Use of Silica Jellies for Bac-

eriological Media, by H. W. Batchelor (Ohio Expt. Sta.); Seed "Sterilization," by A. W. Hofer and H. C. Hamilton (N. Y. State Sta.); A Proposed Grouping of the Mesophilic, Aerobic, Spore-forming Bacilli, by N. R. Smith and F. E. Clark (U. S. D. A.); Multiple Acceptance of Species of *Rhizobium* by *Phaseolus coccineus*, and Desiccated Nodules as a Source of the Root-Nodule Organism, both by J. K. Wilson (Cornell Univ.); Use of *Cunninghamella blakesleeana* and *Aspergillus niger* for Measuring the Manurial Requirements of Plants, by A. Mehlich (Tenn. Sta. et al.); Testing Legume Bacteria Cultures in the Field, by L. T. Leonard (U. S. D. A.); Methods of Testing Cultures of Root Nodule Bacteria for Efficiency, by A. W. Hofer (N. Y. State Sta.); Physiology of Root Nodule Bacteria in Relation to Fertility Levels of the Soil, by W. A. Albrecht (Mo. Sta.); Strain Variation of the Root-Nodule Bacteria, by O. H. Sears (Ill. Sta.); and Some Nitrogenous and Other Electrodialyzable Constituents of the Cotton Plant at Different Stages of Growth Under Differential Fertilizer Treatment, by N. E. Rigler, D. R. Ergle, and J. E. Adams (U. S. D. A.).

[**Botanical studies by the Vermont Station**] (*Vermont Sta. Bul. 452 (1939), pp. 28, 29*).—A brief report is given of studies on the influence of nitrogen in retarding the destruction of chloroplasts in apple leaf cells and the chloroplasts of potato and other Solanaceae.

Arizona plants: New species, varieties, and combinations, T. H. Kearney and R. H. Peebles. (U. S. D. A.). (*Jour. Wash. Acad. Sci., 29 (1939), No. 11, pp. 474–492*).—Having in preparation an account of the flowering plants and ferns of the State, the authors here publish in advance such new taxonomy as it has seemed advisable to recognize.

A new variety of the willow Salix glaucophylla Bebb, C. R. Ball (U. S. D. A.). (*Jour. Wash. Acad. Sci., 29 (1939), No. 11, pp. 492–495*).—*S. glaucophylla albovestita* n. v. is described.

Film yeasts from pickle brines, E. M. Mrak and L. Bonar. (Univ. Calif.). *Zentbl. Bakt. [etc.], 2. Abt., 100 (1939), No. 14–17, pp. 289–294*).—Isolates of film-forming yeasts obtained from various food brines were identified as *Debaryomyces membranaefaciens*, its variety *hollandicus*, *D. guilliermondii nova zeelandicus*, *Pichia membranaefaciens*, or *Mycoderma decolorans*. The *Debaryomyces* spp. were more widely distributed than the others due to their tolerance of high salt concentrations. Authentic cultures of *Debaryomyces* and *Mycoderma* obtained from culture collections had a much lower salt tolerance than those isolated directly from pickle brines. There are 32 literature references.

Amino acid requirements of the heterofermentative lactic acid bacteria, H. G. Wood, C. Geiger, and C. H. Werkman. (Iowa Expt. Sta.). (*Jour. Bact., 38 (1939), No. 1, pp. 112, 113*).—An abstract.

The relation of plant maturity to the type of organisms predominant in plant decomposition, D. W. McKinstry, D. E. Haley, and J. J. Reid. (Pa. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 3 (1938), pp. 180–182*).—A characteristic flora is reported for leaves of growing cigar-leaf tobacco, and a similar one for red clover. Predominant forms on the growing plant were gram-negative rods, while aerobic spore-formers, micrococci, and fungi were also always present, but in smaller numbers. Decomposition of green tobacco was associated with the activities of the gram-negative rods. Immature cigar-leaf harvested late was generally characterized by a gram-negative decomposition in any attempt at fermentation, but when harvested early and cured during late summer it ordinarily developed a gram-positive flora and fermented satisfactorily. Mature leaf improperly cured developed a satisfactory gram-positive flora in some

cases and a gram-negative one in others. Both maturity and cure appear important in the change of substrate from a type favoring the gram-negative to one favoring the gram-positive organisms. Soluble carbohydrates and high protein content were associated with gram-negative development.

The effect of fertilizer treatment upon the type of flora found upon decomposing plant tissues, R. G. Harris, D. E. Haley, and J. J. Reid. (Pa. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 3 (1938), pp. 183–186*).—Although based largely on one season's crop it is believed that the information obtained presents certain significant trends. With potash as the only variable the eight plats studied produced flue-cured tobacco varying in chemical composition according to treatment. As judged by quality (i. e., price received) these plats could be placed conveniently in three groups, while separation on chemical analyses or bacteriological examination gave the same grouping. High quality was produced where an adequate but not excessive amount of potash was incorporated in the fertilizer treatment, the N:K ratio of such tobacco being approximately one. "Rough" gram-negative rods were characteristic of Piedmont flue-cured tobacco high in nitrogen and low in soluble carbohydrates, while "smooth" gram-negative rods characterized the high potash, low nitrogen tobacco. Well-balanced fertilization from the standpoint of quality produced a tobacco on which both smooth and rough gram-negative rods appeared, and in addition organisms not found on tobacco produced with unbalanced treatments.

Strain variation and host specificity of Rhizobium leguminosarum on new pea varieties, L. W. Erdman and J. C. Burton (*Soil Sci. Soc. Amer. Proc., 3 (1938), pp. 169–175, figs. 8*).—Four pea varieties developed to meet the needs of canners and frozen-pea packers were inoculated in the greenhouse with eight strains of *R. leguminosarum* and their comparative efficiency in nitrogen fixation was determined for each variety. Similar tests were also carried out in the field. Under both conditions some strains were more efficient than others on all pea varieties used. Some strains were highly effective on only one or two varieties and very poor on others, but there were some good strains for all four varieties and some poor ones. A strain isolated from a hairy vetch nodule proved to be the most efficient one on all pea varieties used. The source of the organism proved of little value in predicting its probable efficiency on a host variety, and nodulation studies alone (field or greenhouse) failed to give conclusive evidence for evaluating relative efficiencies. These studies emphasize the importance of finding strains of nodule bacteria which will work efficiently on new types or varieties of legumes to insure maximum performance.

Obtaining rhizobia-free cuttings for pure-line studies, W. L. Lott and J. K. Wilson. (Cornell Univ.). (*Soil Sci. Soc. Amer. Proc., 3 (1938), pp. 176–178*).—Data presented render it apparent that success in obtaining cuttings of white clover (*Trifolium repens*) free from rhizobia depends more on the selection of cuttings from stolons which have never been in contact with the soil than on the use of calcium hypochlorite as a disinfectant, either under atmospheric or reduced pressures. Cuttings from field-grown plants are very likely to be contaminated with legume-nodule bacteria and are not easily disinfected with solutions of sufficiently low concentration to be noninjurious to the plants.

Further studies on seed "sterilization," A. W. Hofer and H. C. Hamilton. (N. Y. State Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 3 (1938), pp. 167, 168*).—This is a progress report, continuing work referred to on page 309, on experiments suggesting that for sterilization of the seed surface 10 min. of disinfection should be sufficient. For this purpose a 2 percent chlorine solution diluted 1:10 by adding 8 parts water and 4 percent benzoic acid proved superior to any of the other disinfectants studied, but tests to determine other effects

of such treatment have not been completed. At present 2 percent chlorine solution is still preferable to any other common reagents, since H_2O_2 and Zephiran did not seem particularly effective. Iodoacetone appears to stimulate the development of the "interior organisms" of the seed at times, a factor occasionally of distinct disadvantage.

The effect of ultraviolet radiation on plants, H. W. Popp (*Pennsylvania Sta. Bul. 382 (1939), p. 37*).—A progress report of studies.

Effect of ultra-short radio waves on plant growth, J. van Overbeek, L. R. Brantley, and G. W. Potapenko (*Science, 90 (1939), No. 2342, pp. 470, 471*).—Maize seedlings showed reduced growth of the first internode and reduced auxin production after ultrashort wave radiation lasting 20 to 30 sec. Application of additional auxin (indoleacetic acid) restored the first internode to normal. The effect of ultrashort radio waves was judged to be very likely a heat effect because similar to that produced presumably by heat alone. Exposure to ultrashort radio waves for 60 sec. or longer usually killed the corn seedlings, while a 10-sec. exposure produced no apparent effect.

Contact depletion of barley roots as revealed by radioactive indicators, H. Jenny, R. Overstreet, and A. D. Ayers. (Univ. Calif.). (*Soil Sci., 48 (1939), No. 1, pp. 9–24, fig. 1*).—The authors describe the principles of radioactive indicators and their adaptation to the study of contact interchange of cations between plant roots and soil colloids, and discuss the results of their studies with barley roots. Plants containing radioactive potassium retained this isotope against distilled water but released it to salt solutions and clay suspensions. For equal amounts of cations in the nutrient media, the colloids greatly exceeded the single-salt solutions in removing radioactive K from roots, and its outgo increased with concentration of nutrient medium and with time of contact. Tests with radioactive sodium also showed clay suspensions to be more efficient depleting agents than salt solutions of corresponding cation concentrations. These relationships were reversed when direct contact was prevented by placing semipermeable membranes between roots and clay particles. For plants containing radioactive Br anions the clay suspensions removed smaller amounts of the isotope from the roots than did the corresponding salt solutions. Contact depletion of roots by clay particles is shown not to result from root injury, and intake of ions by roots not to be a unidirectional process. The results obtained are believed to fully confirm previously published data obtained with total K analyses of excised barley roots. It is considered now fairly certain that the theories of chemical soil solution no longer suffice to explain completely the absorption of mineral elements by plants from soils, but that they must be supplemented by consideration of contact effects.

The path of fluorescein movement in the kidney bean, Phaseolus vulgaris, E. M. Palmquist. (Cornell Univ.). (*Amer. Jour. Bot., 26 (1939), No. 8, pp. 665–667*).—The xylem of untreated cross sections of twigs of representatives of some 25 genera showed traces of fluorescence and on ammonia vapor treatment a brilliant yellow light similar to that of fluorescein on examination with a fluorescence microscope, but in neither case did the xylem of young bean plants fluoresce. Fluorescein was applied to a series of thoroughly watered bean plants, and 24 hr. later cross sections of the stems showed fluorescence in the phloem but not in the xylem. Again exposure to ammonia vapor failed to induce fluorescence in the xylem. It is concluded that fluorescein moves in the phloem of bean plants.

Delayed killing of maize seeds X-rayed at liquid-air temperature, L. R. Maxwell and J. H. Kempton. (U. S. D. A.). (*Jour. Wash. Acad. Sci., 29 (1939), No. 9, pp. 368–374, figs. 2*).—The authors classify the stages in the

biological effects of X-radiation and suggest that maintaining seeds at liquid-air temperatures during irradiation should greatly reduce the number of thermal reactions occurring during the process. In the tests reported, delayed killing of maize seeds by X-rays occurred for a dosage of 70,000 *r* units when irradiated at about −187° C. The extent of growth of delayed killed plants at such temperatures was significantly greater than for seeds irradiated at room temperature. It is concluded that delayed killing of maize is not primarily due to temperature-dependent thermochemical reactions that might occur during the irradiation period. Factors inducing delayed death were diminished by using liquid-air temperatures during irradiation.

Effects of temperature and sunlight on the rate of elongation of stems of maize and gladiolus, A. G. McCalla, J. R. Weir, and K. W. Neatby (*Canad. Jour. Res., 17 (1939), No. 11, Sect. C, pp. 388–409, figs. 5*).—In these studies "partial correlation coefficients showed that there was a highly significant positive association between the rate of stem elongation (growth) and temperature, regardless of the time of day, the variations in temperature accounting for from 40 to 70 percent of the variability in growth rates. There was likewise a significant negative correlation between growth and sunlight, but sunlight was apparently effective only during the midday period (8 a. m. to 4 p. m.). The depressing effect of sunlight on the growth of gladiolus was approximately four times as great as on maize. This depressing effect on maize was entirely removed by shading the plants with light white cotton. Variations in relative humidity were only slightly associated with growth rates. No significant effect was observed for any of the periods. It seems possible that these factors might be more important under conditions of deficiency in soil moisture. The approximate minimum temperature at which growth took place was 40° F."

Photoperiodic induction as influenced by environmental factors, E. M. Long. (U. S. D. A. et al.). (*Bot. Gaz., 101 (1939), No. 1, pp. 168–188, figs. 2*).—Biloxi soybean and *Xanthium pennsylvanicum* leaves are said to be the locus of photoperiodic induction, and when induced leaves are grafted to vegetative plants they continue to supply a stimulus for flower initiation when exposed to continuous long photoperiod. When during each 24-hr. period the plants were exposed to 15-hr. dark periods at 40° F., alternating with 9-hr. photoperiods at ±70°, then 6–8 such consecutive cycles of dark period and photoperiod were required for photoperiodic induction. Treatment with 4 such cycles produced a residual effect lasting more than 24 hr. In these tests Biloxi soybeans flowered only after exposure to consecutive long dark periods, each alternating with a short photoperiod. Regardless of the number of long dark periods, plants did not flower unless at least 3 of the dark periods were in consecutive order. Exposure to an induction period of 3 or more consecutive long dark periods, resulting in a certain number of flower primordia, did not lead to subsequent new primordia unless the plants were again exposed to another induction period of 3 or more long dark periods. The length of the critical dark period decreased slightly with increasing age of plant and varied slightly with changes in humidity, but if shaded during their photoperiods the critical dark periods increased slightly. Temperature variations greatly affected the length of the critical dark period, that of plants at 70° being ±8½ hr. and that of plants at 40° ±11 hr.

The influence of varying cation proportions upon the growth of young cotton plants, C. H. Wadleigh. (Ark. Expt. Sta.). (*Soil Sci., 48 (1939), No. 2, pp. 109–120, figs. 4*).—Cotton was grown in nutrient solutions varying in proportions of K, Ca, Mg, and Fe, but in very dilute concentration, only cations entering into the variability and the proportions being calculated on the equivalence basis. Growth proved directly related to the level of K supply, while in-

creasing the Fe^{+++} supply had a distinctly adverse effect on it. The influence of Ca^{++} and Mg^{++} was not so pronounced as that of the other two cations, but tended to be beneficial unless they supplied a preponderance of the total variable cations. The pH changes in the substrate were inversely related to the K : Fe ratio, viz, the higher this ratio the less change in H^+ in the solution. It was suggested that at the higher levels of Fe^{+++} a larger proportion of cations absorbed, in relation to a given amount of anion absorption, is H^+. Some of the theoretical implications of the results are discussed.

Physiological activity of a series of indolyl acids, N. H. Grace (*Canad. Jour. Res., 17 (1939), No. 11, Sect. C, pp. 373–375*).—The physiological activities of a series of indolyl acids from acetic to valeric were determined by the rooting responses of *Lonicera tatarica* cuttings. Indolylbutyric acid proved the most active, affecting the number and length of roots per rooted cutting, mean root length, green weight of leaves, and fresh root weights. Indolylacetic acid had significant effects on the number and length of roots per rooted cutting. Slight activity was shown by indolylpropionic acid, but neither indolylvaleric nor 5-methyl-indolylpropionic acids exhibited any significant effects, and none of the acids affected the number of cuttings rooted.

Growth factor requirements of four species of isolated roots, J. Bonner and P. S. Devirian (*Amer. Jour. Bot., 26 (1939), No. 8, pp. 661–665, fig. 1*).—Isolated pea roots were cultivated indefinitely in a nutrient medium containing vitamin B_1 and nicotinic acid plus mineral salts and 4 percent sucrose, and addition of various other substances (named) failed to increase their growth. Isolated radish roots were cultivated through 14 passages in 6 mo. in a medium containing vitamin B_1 and nicotinic acid plus the basic nutrient, and here again addition of various substances failed to increase the growth rate. Isolated flax roots were cultivated through 14 transfers with vitamin B_1 as the only accessory growth factor required by the strain used, and additions of vitamin B_6 or nicotinic acid were without significant effect on the growth rate. Confirmation was obtained that isolated tomato roots can be cultivated indefinitely in a mineral salt medium with sucrose containing as growth factors only vitamins B_1 and B_6, but the growth rate was increased markedly by adding nicotinic acid to the medium.

Effectiveness of several growth substances on parthenocarpy in holly, F. E. Gardner and P. C. Marth. (U. S. D. A.). (*Bot. Gaz., 101 (1939), No. 1, pp. 226–229*).—Having discussed in an earlier paper (E. S. R., 78, p. 761) the superiority of naphthaleneacetic acid over certain other growth-promoting substances for inducing parthenocarpy in the American holly, the authors expanded their tests to include several compounds of naphthalene. In both greenhouse and outdoor trials, naphthaleneacetamide proved more potent than naphthaleneacetic acid and had the advantage of not producing any observable nastic disturbances of the leaves or petioles. Of notable interest was the relative ineffectiveness of the K salt of naphthaleneacetic acid. It is suggested that the effect of the substances in stimulating fruit development may be in preventing the formation of an abscission layer, thus permitting the flow of nutrients necessary for fruit growth and perhaps substituting in part for the stimulus set up by the developing fertilized ovule.

A second growth factor for excised pea roots: Nicotinic acid, F. T. Addicott and P. S. Devirian (*Amer. Jour. Bot., 26 (1939), No. 8, pp. 667–671, figs. 4*).—"An essential growth factor for excised pea roots, necessary in addition to vitamin B_1 and present in yeast extract, was not found to be among the amino acids nor the microelements of plant nutrition. Nicotinic acid can

act as this growth factor. Salts, sugar, vitamin B_1, and nicotinic acid can support the growth of pea roots indefinitely."

Histological and physiological responses of bean plants to alpha naphthalene acetamide, E. J. Kraus and J. W. Mitchell. (U. S. D. A. et al.). (*Bot. Gaz., 101 (1939), No. 1, pp. 204–225, figs. 15*).—Among some 36 growth substances previously reported upon, α-naphthaleneacetamide resulted in such striking and characteristic effects that attention is here called to the results of several experiments in which it was used. Applied in lanolin mixture to the cut surface of decapitated kidney bean plants it induced the mobilization of solid substances toward the place of application, but this effect was quantitatively less than when indoleacetic acid was used. However, it is said that direct comparisons of the magnitude of the responses cannot be made because of the relative insolubility of the acetamide. When plants were sprayed with a lanolin emulsion of the substance, differences in the size of treated and untreated plants were noticeable within 24 hr. The second internodes, petioles, and blades of the primary leaves of treated plants showed no appreciable increase in length, while corresponding parts of controls showed a definite increase. After ±10 days the elongation of the treated plants was still less than that of the controls, but the above-ground parts (except the second internode) were of greater diameter and much stiffer and firmer to the touch. After 2 weeks, the height and total leaf area of treated plants were appreciably less than those of controls and the primary leaves were much smaller, but the amount of solid matter accumulated in the petioles and blades was about the same. The histological evidence indicated that the distribution of the solid matter was very different in the two cases, in treated plants much of it apparently being represented in wall thickenings and as secondary xylem.

The histological and physiological reactions to indoleacetic acid and the acetamide were in a few respects similar, but in many other ways they were widely different. It is therefore suggested that through the use of these compounds the opportunity to study the differential response and development of cells and tissues in relation to growth substances of known chemical composition is appreciably increased.

Auxin production by soil microorganisms, J. L. and E. Roberts. (Ind. Expt. Sta.). (*Soil Sci., 48 (1939), No. 2, pp. 135–139*).—Tests were made of 150 species of actinomycetes, bacteria, and molds from Indiana soils to determine their ability to produce plant growth substances from beef extract-peptone agar, 75 of them also being tested on a synthetic medium without tryptophane. On the organic medium 66 percent produced auxin, whereas only 30 percent did so on the synthetic substrate.

Thiamin and symbiosis, W. J. Robbins (*Bul. Torrey Bot. Club, 66 (1939), No. 8, pp. 569–572, fig. 1*).—Unlike many fungi, including *Phycomyces blakesleeanus*, some species are able to synthesize thiamin from elementary constituents and to grow in media lacking this growth substance. In other words one part of the living world appears to depend for thiamin on another in somewhat the same fashion as one part depends on the other for carbohydrates or for organic nitrogen. An example is given in which a *Penicillium* contaminant in a thiamin-deficient culture of *Phycomyces* supplied enough of this substance for normal growth of the latter fungus. While thiamin was involved here, it is emphasized that other growth substances may be concerned in the relationships between organisms. Doubtless other examples will be discovered in which the synthetic activities of organisms completely autotrophic for growth substances are able to supply that which is lacking for the heterotrophic forms.

Effects of plant and animal hormones on the rooting of dust- and solution-treated dormant stem cuttings, N. H. GRACE (*Canad. Jour. Res., 17 (1939), No. 9, Sect. C, pp. 305–311*).—Indolebutyric acid and oestrone were applied as dusts to dormant stem cuttings of *Lonicera tatarica*, *Spiraea vanhouttei*, and *Cornus alba*, and in both dust and solution form to *Ribes odoratum*. The first had significant effects on the number of cuttings rooted and on the number and length of roots per rooted cutting of three species, and it also affected the fresh-root weight of cuttings of *Spiraea* and the green-leaf weight of *Ribes*. Oestrone had no significant effect on rooting, but in solution exhibited significant effects on the green-leaf weight of *Ribes*, both alone and with indolebutyric acid. The *Cornus* cuttings failed to show any significant effects of the treatments. Dust and solution methods compared on *Ribes* cuttings effected 62 and 42 percent rooting, respectively, and there was also a markedly greater leaf development with the dust method.

Sexual hormones in Achlya.—I, Indicative evidence for a hormonal coordinating mechanism, J. R. RAPER (*Amer. Jour. Bot., 26 (1939), No. 8, pp. 639–650, figs. 27*).—*A. ambisexualis* n. sp. and the new varieties *abjointa* and *gracilis* are described. The sexuality of the plant is said to agree with that of other partially separate-sexed species of water molds which have been described as heterothallic. The successive stages in the sexual reaction of *A. ambisexualis* and *A. bisexualis* are described in detail, and until the time of female gametangial differentiation five stages are recognized. The rigid sequence of events and the constantly proportionate time intervals between these stages are believed to indicate a well-developed coordinating mechanism. Incompatibility in interspecific matings between these two species apparently results from interruption of this coordinating mechanism, and the reaction differs in the two reciprocal matings. By varying the composition of the medium, disruption of the sexual process at times coinciding with the initiation of the several stages indicates specific substances as the coordinating agents. On the basis of these findings a hormonal system is outlined, four specific substances being involved, two from the male and two from the female.

Effect of ammonium and nitrate nitrogen on the mineral composition and sap characteristics of barley, D. I. ARNON. (Univ. Calif.). (*Soil Sci., 48 (1939), No. 4, pp. 295–307, figs. 6*).—Analyses for Ca, Mg, K, N, and P and determinations of pH, conductivity, and total sugars of the expressed sap were made on 5-week-old barley in nutrient solutions supplied either with ammonium or nitrate as the sole N source, the plants having been grown at different seasons with control of the variables of pH, aeration, and Mn concentration. The ammonium plants had a higher P and a lower Ca, Mg, and K content than the nitrate plants. No consistent relation was found between the N source, the external reaction, and the N content of the plant, and none for the two seasons of the year between the reaction of the solution and the absorption of cations v. anions. Varying the pH of the solution from 4 to 6.7 had little influence on the pH of the expressed sap, but the sap of shoots of ammonium plants had a consistently higher sugar concentration than that of the nitrate plants. The root sap of ammonium plants had a very much lower conductivity than that of the nitrate plants, but the conductivity of the shoot sap varied but little between the two treatments. Nitrate plants had a greater absorptive power for Mn than the ammonium plants. The possible relation of limited Mn absorption to the restriction of growth in ammonium plants and the influence of the ionic form of N on the absorption of other ions are discussed.

Absorption of iron from finely ground magnetite by citrus seedlings, H. D. CHAPMAN. (Calif. Citrus Expt. Sta.). (*Soil Sci., 48 (1939), No. 4, pp. 309–315, pl. 1*).—Absorption of Fe from sand cultures under the experimental set-up was shown to be made possible by the formation of intimate contacts between root and iron oxide particles, in which conditions for the extraction or solution of Fe must necessarily differ from those prevailing in the surrounding solution. Addition of $CaCO_3$ reduced the availability of Fe, and in cultures containing 0.1 percent magnetite less frequent flooding enabled the plant to obtain adequate iron whereas frequent flooding brought on Fe chlorosis, resulting from pH differences developing under the variable flushing frequency. The data emphasize the view that the "soil solution" involves separate though not independent parts, one of which consists of the intimate contact zones between roots and all manner of soil particles and the other the external solution. Under ample moisture conditions these phases are more or less intercommunicating and with mutual influences. It is believed probable that the number as well as the intimacy and character of the contacts is important in determining the final question of nutrient adequacy or inadequacy. It is suggested that the ability to obtain adequate Fe from alkaline soils is due in part to contact feeding on Fe-bearing minerals. The occurrence of Fe chlorosis in some calcareous soils and not in others may be due in some cases to differences in the amount of potentially available Fe present. Under irrigation it is commonly observed that this chlorosis often develops, possibly in part resulting from a gradual coating over of Fe minerals with insoluble carbonates. Increasing the pH, also resulting from this slow deposition of carbonate, is likewise probably involved.

Changes in intercellular relationships during the growth and differentiation of living plant tissues, E. W. SINNOTT and R. BLOCH (*Amer. Jour. Bot., 26 (1939), No. 8, pp. 625–634, figs. 8*).—In studying growth and differentiation in living tissues of the growing region of certain grass roots, the changes in intercellular relationships observed were the result of differing rates of growth in different parts of the cell wall. This was evidenct where a cell was in contact with two others of unequal growth rates, and other more specialized cases of differential wall growth are briefly discussed. Reported instances of sliding growth are reviewed, and it is shown that they may be explained by differential growth of the cell wall. The implications of these results for the general problem of development are discussed, and the importance of a more extensive knowledge of the structure and growth of the cell wall is emphasized.

The morphology of the flowers of the Juglandaceae.—I, The inflorescence, W. E. MANNING (*Amer. Jour. Bot., 25 (1938), No. 6, pp. 407–419, figs. 51*).—The inflorescences of all six genera are described and illustrated.

The significance of wood anatomy in the taxonomy of the Juglandaceae, C. HEIMSCH, JR., and R. H. WETMORE (*Amer. Jour. Bot., 26 (1939), No. 8, pp. 651–660, figs. 21*).—Using wood specimens from a majority of the species of the family, this investigation was undertaken to determine to what degree a study of the xylem anatomy might confirm the results of Manning's study of the inflorescences, noted above. With the exception of *Platycarya*, the results are said to be in striking accord. "Intensive study of intrageneric variations in anatomy gives few facts to support the idea that the established criteria employed in phylogenetic investigations based on anatomy are adequately refined for intrageneric interpretations."

Nuclear structure and behavior in species of the Uredinales, D. B. O. SAVILE (*Amer. Jour. Bot., 26 (1939), No. 8, pp. 585–609, figs. 106*).—Using new staining methods, it is shown that there are two distinct types of nucleus in the rusts, and the transition from one to the other is elucidated. The "unex-

panded form" is adopted at all life-cycle stages where it migrates through a narrow pore. In transforming to the "expanded form" a new nuclear sphere is formed about the original nucleus, and the chromatin all passes into the outer part. This second form is found in the aeciospores, urediniospores, and teliospores, and in their basal and spore mother-cells, suggesting a possible common origin of these three spore forms. Nuclear division was followed in great detail, using the Feulgen method, and is described.

The chemical composition of Suckleya suckleyana, C. G. BARR, H. W. REUSZER, and F. THORP, JR. (Colo. Expt. Sta.). (*Science, 90 (1939), No. 2343, pp. 497, 498*).—Preliminary studies of the carbohydrate and nitrogen content of this poisonous plant are presented. A result of prime interest was the marked reduction of protein N with advance of season accompanied by an equally rapid formation of HCN, which is deemed worthy of further investigation and may aid in clarifying some of the problems of metabolism in plants in general. No accumulation of starch but a rapid increase in reducing sugars was noted during the period of protein N diminution. It is suggested that the presence of available carbohydrates may stimulate the synthesis of HCN-containing glucoside, and that this synthesis is probably not checked by limited nitrates provided favorable factors for liberal protein formation have been present early in the season.

The causes of self-sterility in rye, M. LANDES (*Amer. Jour. Bot., 26 (1939), No. 8, pp. 567–571, figs. 12*).—Seeds are said to develop on less than 10 percent of the selfed florets of rye. It was found that much of this self-sterility could be attributed to failure of pollen tube growth, but also that a large proportion of self-pollinated ovaries aborted in early stages. In the latter case no cellular endosperm tissue was formed, which accounts for much of the self-sterility. There was also abortion in some of the crossed ovaries, but much less than in the selfed ones. In the ovules which developed there were irregularities in the endosperm which were more numerous in the selfed ones. In 5–10 percent of the ovules on most plants examined no embryo sac had formed.

Estimation of leaf area in wheat from linear dimensions, J. W. HOPKINS (*Canad. Jour. Res., 17 (1939), No. 9, Sect. C, pp. 300–304, fig. 1*).—Measurements of 80–90 leaf blades of each of four varieties of spring wheat at various developmental stages indicated a fairly close statistical relation between area and length and width, and proving to be essentially the same for all four varieties. From these data a formula was worked out and is here presented for estimating leaf areas which is said to be rapid and easily carried out without removing the leaves from experimental plants.

GENETICS

Symposium on the cell theory (*Amer. Nat., 73 (1939), No. 749, pp. 481–546, figs. 11*).—The following papers are included: Its Past, Present, and Future, edited by J. Mayer (pp. 481–484); Microscopy Before the Nineteenth Century, by L. L. Woodruff (pp. 485–516); Schleiden's Contribution to the Cell Theory, by J. S. Karling (517–537); and Predecessors of Schleiden and Schwann, by E. G. Conklin (pp. 538–546).

The submicroscopic structure of cell walls, A. FREY-WYSSLING (*Sci. Prog. [London], 34 (1939), No. 134, pp. 249–262, figs. 8*).—This is a critical review with 27 literature references.

Controlled differentiation in a plant tissue culture, P. R. WHITE (*Bul. Torrey Bot. Club, 66 (1939), No. 8, pp. 507–513, figs. 2*).—"Cultures of callus from a hybrid *Nicotiana* which, on a semisolid nutrient, have been maintained in

an undifferentiated state through many passages can be made to form leafy branches of a high degree of differentiation by immersing them in a liquid nutrient. It is suggested that oxygen gradients may be important factors in controlling differentiation. Some of the implications of this observation for the concept of the cell as a totipotent elementary organism are briefly mentioned."

[Genetics studies by the Vermont Station] (*Vermont Sta. Bul. 452 (1939), pp. 23, 24*).—A brief report is presented on genetic studies with the violet, including observations on pollen growth, crossing relationships, polyploidy, and chromosome structure.

Chromosome structure, B. R. NEBEL. (N. Y. State Expt. Sta.). (*Bot. Rev., 5 (1939), No. 11, pp. 563–626, figs. 30*).—In this comprehensive review (over 11 pages of references) preference is given to recent work on plants, though animal chromosomes are not omitted wherever the work is considered of general importance. To avoid misunderstanding, the terminology is defined and the hope is expressed that the committee on nomenclature will soon eliminate unnecessary synonyms. The subject matter is discussed under the following headings: The number of individual threads contained in a large somatic plant chromosome; the effect of X-rays on chromosomes; general considerations concerning genes; chromosome structure and evolution; synapsis; methods and physiology; spindle and mitotic apparatus; the kinetochore; chromomeres; matrix, nucleolus, heterochromatin; polarized light; coiling; and genic multiplication.

The production of homozygous deficient tissues with mutant characteristics by means of the aberrant mitotic behavior of ring-shaped chromosomes, B. MCCLINTOCK. (Cornell Univ. and Mo. Expt. Sta.). (*Genetics, 23 (1938), No. 4, pp. 315–376, pls. 2, figs. 43*).—The method by which viable tissues, homozygous-deficient for a known region of a chromosome, may be produced in corn is described, and is indicated as related to the unique behavior of ring-shaped chromosomes during somatic mitosis. The chromosomal region involved includes the locus of the gene Bm_1 in chromosome V (allel of bm_1, brown midrib, producing a brown color in the lignified cell walls). The lignified cell walls of the homozygous-deficient tissue exhibit features charactertistic of the recessive gene bm_1 although the locus of this gene is absent. Successive sections of the paper treat of the mitotic behavior of ring-shaped chromosomes, the nature of the Bm_1–bm_1 variegation, types of functional gametes produced by the two original variegated plants, production of plants mosaic for homozygous deficiencies, simulation of the bm_1 phenotype through loss of the Bm_1 locus, the production and appearance of plants homozygous for Def2 R2, and the phenotypic effect of altered ring-chromosomes.

Chromosome doubling in potatoes induced by colchicine treatment, F. E. JOHNSTONE, JR. (Cornell Univ.). (*Amer. Potato Jour., 16 (1939), No. 11, pp. 288–304, figs. 3*).—Colchicine induced chromosome doubling in Russet Rural and Golden potatoes (*Solanum tuberosum*), in seedlings of U. S. D. A. lines S. 164–126 and 164–196, in Louisiana Station line T3–4, and in the wild species *S. jamesii*, *S. chacoense*, *S. bulbocastanum*, *S. andigenum*, and *S. neoantipovichii*. Seed treatment and sprout treatment experiments in which tetraploids were produced are reported on, and the polyploid plants and methods of identifying them are described, with discussion of the practical significance of tetraploidy in the potato.

The nature of chromosome division and the duration of the nuclear cycle, A. MARSHAK. (Univ. Calif.). (*Natl. Acad. Sci. Proc., 25 (1939), No. 10, pp. 502–510, figs. 3*).—Chromosome fragments containing a portion of only one chromonema were found after treatment of the root tip of *Vicia faba* with neutrons or X-rays. Very few were noted during the first 12 hr. and later than

48 hr. after irradiation. A sharp maximum in frequency observed at 18 hr. was attributed to a critical stage in the synthesis of new chromonemata in the "resting" nucleus. The maximum duration of the interval from the beginning of the resting stage to anaphase after treatment with 122 r or 20 "n" was probably about 48 hr. A method for determining the duration of the normal interval is indicated. Pairs of these fragments could be seen to be derived from disjoining half-chromatids. This is taken as evidence that the new pair of chromonemata formed in the resting stage are separated from the old pair in the succeeding anaphase.

A comparison of the sensitivity of mitotic and meiotic chromosomes of Vicia faba and its bearing on theories of crossing-over, A. MARSHAK. (Univ. Calif.). (*Natl. Acad. Sci. Proc., 25 (1939), No. 10, pp. 510–516, figs. 2*).—The maximum number of chromosome abnormalities was observed at about 24 hr. after irradiation with X-rays. The most sensitive stage in the meiotic cycle is pachytene. The sensitivity curve for meiotic chromosomes had almost exactly the same slope as that for somatic chromosomes. The relation of these observations to theories of crossing-over is discussed.

A study on the date of ear emergence in barley, G. D. H. BELL (*Jour. Agr. Sci. [England], 29 (1939), No. 2, pp. 175–228, figs. 19*).—Study of the spike emergence characteristics of barley varieties when grown under varying conditions indicated that expression of this character is affected greatly by growing conditions. It appeared that genetic analysis should proceed in conjunction with a physiological analysis and with due consideration for environmental effects. Crosses among varieties differing in time of spike emergence, etc., showed how differences in genetic behavior could be correlated with the physiology of spike emergence of the parents. In a cross involving similar types, evidence of segregation or large genetic difference was not obtained. In two crosses involving larger differences of similar types, a single major factor difference with 3:1 ratio for earliness dominance was observed. In other crosses between different physiological types, more complex results including transgressive inheritance were obtained. Other crosses suggested a 3:1 ratio in the F_2, but the presence of transgression and the F_3 behavior pointed to a more complicated relationship. In two crosses involving different physiological types, the behavior of F_1 and F_2 of the same cross was affected by time of planting.

Maize seed characters in relation to hybrid vigor, M. E. PADDICK and H. B. SPRAGUE. (N. J. Expt. Stas.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 9, pp. 743–750, fig. 1*).—The pollen parent seemed to be able to exert some influence on the weight of both the germ and endosperm of the corn kernel and the ratio between them. The general effect of outbreeding on the kernel is size stimulation. Germ size in reciprocal hybrid kernels might vary greatly despite uniformity of mature plants, tending to substantiate Sprague's (E. S. R., 77, p. 32) views on Ashby's hypothesis that embryo size is not a significant factor in the induction of hybrid vigor. The ratio of endosperm-germ weight within a specific line appeared to remain relatively constant regardless of kernel size. No correlation was apparent between weight increase of hybrid kernel germ over that of the ear parent, when borne on the same ear, and forage-yielding ability. A barely significant correlation ($r=0.39$) was seen between this germ weight increase and grain-yielding ability of hybrid strains.

A developmental analysis of heterosis in Lycopersicon.—I, The relation of growth rate to heterosis, W. G. WHALEY (*Amer. Jour. Bot., 26 (1939), No. 8, pp. 609–616, figs. 6*).—In studies of the growth rates of the parents and hybrids in two *Lycopersicum* species crosses showing heterosis, it was observed that heterosis produces its effects by an influence on total plant size and that the size

of the determinate organs is not increased but that they are produced greater numbers. The hybrids were found to grow more rapidly than eith parent in the early postembryonic stage and during the fruiting stage. T differences were much less marked during the grand period of growth. T presence of heterosis is not always accompanied by the possession by the hybr of a larger embryo.

The influence of inbreeding and selection on the hereditary factors animal races [trans. title], R. GRUHN (*Ztschr. Tierzücht. u. Züchtungsbio 42 (1939), No. 1, pp. 1–61, figs. 3*).—A theoretical discussion is given of t mathematical possibilities of increasing homozygosity by successive generatio of inbreeding.

Genetics of dairy cattle, A. D. BUCHANAN SMITH (*Jour. Dairy Res.* [*London 10 (1939), No. 2, pp. 370–393*).—A biennial review, with 158 references to t literature (E. S. R., 78, p. 769).

A moose-dairy cow cross? W. W. GREEN and R. FENSTERMACHER. (Min Expt. Sta.). (*Jour. Hered., 30 (1939), No. 10, pp. 458–460, figs. 2*).—The anaton is described of two abnormal animals suggested as possibly being the result crossing a moose with a cow.

Inheritance of horns in sheep, B. L. WARWICK and P. B. DUNKLE. (Te Expt. Sta.). (*Jour. Hered., 30 (1939), No. 8, pp. 325–329, figs. 3*).—To test t possibility that the genes *H* for hornlessness, *H'* for Dorset horns, and *h* f Merino and Rambouillet horns form a multiple allelic series, an F_1 Dorset Rambouillet ram was backcrossed to Merino and Rambouillet ewes with knob Eight ♀ progeny had horns like F_1 Dorset × Merino ewes, whereas 14 ha knobs like Merino and Rambouillet ewes. None had depressions, as is e pected on the basis of 2 pairs of genes. *H*, *H'*, and *h* are therefore considere to be multiple allels.

Hereditary umbilical hernia in dogs, J. McI. PHILLIPS and T. M. FELTO (Jour. Hered., *30 (1939), No. 10, pp. 433–435, figs. 3*).—Umbilical hernia seem to be inherited in dogs of several breeds as a recessive Mendelian characte independent of sex, color, and deafness, and may be due to multiple factor

The origin of the Mexican hairless cat, I. M. MELLEN (*Jour. Hered.,* *(1939), No. 10, pp. 435, 436, fig. 1*).—The New Mexican cat, which now seems be extinct, is described as a scant-haired Paraguayan cat of small size.

A linkage between shaker-2 and wavy-2 in the house mouse, G. D. SNE and L. W. LAW (*Jour. Hered., 30 (1939), No. 10, p. 447*).—Data are presente to show a crossover percentage of 27 in ♂♂ and 25 in ♀♀ between shaker and wavy-2 in the house mouse.

The genetics of non-epithelial tumor formation in mice, C. C. LITTL W. S. MURRAY, and A. M. CLOUDMAN (*Amer. Nat., 73 (1939), No. 748, pp. 46 469*).—The 121 nonepithelial tumors occurring spontaneously in one inbre strain of mice and the 23 nonepithelial tumors in another strain showed n significant difference in the occurrence between the breeding ♀♀, the virgi ♀♀, and ♂♂. The occurrence of the tumors was significantly different in t two parental strains and in the hybrids between them. There was indicatio of a greater number of tumors among the dilute mice, but more data a needed to confirm the significance of this difference.

Heredity in infectious disease, L. T. WEBSTER (*Jour. Hered., 30 (1939), N 9, pp. 365–370, figs. 7*).—Batches of mice were found to show marked differenc in resistance and susceptibility to mouse typhoid and encephalitis in about 1 generations. Crossing and backcrossing susceptible and resistant lines indicate that resistance to each injection was dominant and controlled by a single pa of genes. There was no tendency for known susceptibles to become immunize through exposure in an epidemic.

Genetics of the fowl.—VII, Breed differences in susceptibility to extreme heat, F. B. HUTT. (Cornell Univ.). (*Poultry Sci., 17 (1938), No. 6, pp. 454–462, fig. 1*).—In continuation of this series (E. S. R., 77, p. 610), there were noted differences in mortality during an excessive heat wave in 1936 between White Leghorns and Barred Plymouth Rocks and Rhode Island Reds. The color and morphological characteristics of the White Leghorn may give more control over the thermoregulatory processes than is possessed by the two heavy breeds. The breed differences in heat resistance as determined by analyses within breeds seemed independent of body size and egg production, but resistance tended to decrease with age.

Genetics of the fowl.—IX, Naked, a new sex-linked mutation, F. B. HUTT and P. D. STURKIE. (Cornell Univ.). (*Jour. Hered., 29 (1938), No. 10, pp. 370–379, figs. 5*).—Continuing this series, noted above and previously (E. S. R., 81, p. 263), the authors describe a new sex-linked recessive factor, formerly noted as *n* for naked (E. S. R., 78, p. 768), which caused in most birds an almost complete lack of down and juvenile feathers and deficient feathering in the adult. The F_2 population consisted of 712 normal-feathered and 246 naked birds. Insofar as they were sexed, all the naked birds were ♀♀. A backcross produced equal numbers of normals and nakeds. About half of the 287 naked chicks died during the last 3 days of incubation, as compared with 8.5 percent of the 755 normal chicks. Mortality was also higher after hatching—55 percent during the first 6 weeks in naked chicks and 13 percent in normal chicks. Skin transplantation from nakeds to normals and vice versa showed that the feather growth continued the same as in the donor, and cysteine feeding did not affect feather growth of the naked birds.

Predictability of body weight from live shank measurements, I. M. LERNER. (Univ. Calif.). (*Poultry Sci., 18 (1939), No. 5, pp. 378–380*).—Study of the correlations between live shank length and body weight of chicks at 4, 8, 12, and 16 weeks of age showed that shank length and body weight at an earlier age were equally reliable for predicting body weight at a later age. Body weight and shank length were more closely correlated during the growing stages than in mature birds.

Structural anomalies and color mosaics observed in a colony of domestic pigeons, W. M. LEVI and W. F. HOLLANDER (*Jour. Hered., 30 (1939), No. 10, pp. 453–457, figs. 4*).—Six pigeons are described which involve abnormalities of the feathers, skeleton, or eyes. The dominant behavior of silky plumage was the only case definitely known to be hereditary. In four color mosaics, the dominant allel seemed to be lost from a part of a heterozygote. All mosaics showed more or less piebaldness which could be traced to the mother.

Inherited non-barring of the flight feathers in turkeys, V. S. ASMUNDSON. (Univ. Calif.). (*Jour. Hered., 30 (1939), No. 8, pp. 342–348, figs. 3*).—Both ♂ and ♀ turkeys with black primary flight feathers and black secondary flight feathers with white tips were found in a flock of Bronze turkeys. The young poults were considerably lighter in color than mature turkeys. Matings of black-winged bronze with Bourbon Reds produced birds resembling Bronze in the distribution of pigment in the down. Matings of black-winged bronze birds to Bourbon Reds suggested that black-winged bronzes are homozygous for the factor *R*, and nonbarring of the wings was determined by the recessive autosomal gene *l*. Black-winged bronze results from the factors *RRll*, whereas Bourbon Red is *rrLL*. Double recessives were assumed to have pure white down. Black-winged bronze birds mated with white produced only bronze, although there was usually a white edging and a wide pure white tip on the

secondaries. The genes *L* and *l* had little or no influence on the distribution of brown melanin. Birds with the Narragansett pattern, except for nonbarred flight feathers, were obtained in the F_2 generation after crossing with Narragansetts.

A study of intersexuality in Drosophila virilis, G. A. Lebedeff. (Cornell Univ.). (*Genetics, 24 (1939), No. 4, pp. 553–586, pls. 5, figs. 2*).—*A gene on the third chromosome of D. virilis* which converts ♀♀ into sterile ♂♂ results in *varying degrees of intersexuality*. The gonads start development as ovaries until after the turning point in hermaphrodites, when an ovotestis is formed which is gradually transformed into a testislike organ. Gametogenesis was abortive in the intersexes.

A rapid extractor for urinary androgens: Factors to be considered in the preparation of extracts for colorimetric assay, N. B. Talbot and G. O. Langstroth (*Endocrinology, 25 (1939), No. 5, pp. 729–736, fig. 1*).—Recovery of as much as 90 percent of the urinary androgens is described by use of benzene for 1 hr. A loss of androsterone and dehydroisoandrosterone was detected when ether extract was cleared with decolorizing charcoal. It is concluded that assay of materials decolorized with charcoal *does not give an accurate indication of the original sterone content of the urine.*

A comparison of four methods of bioassay for the gonadotropic factors, R. T. Frank and R. L. Berman (*Endocrinology, 25 (1939), No. 5, pp. 683–688, figs. 3*).—In a comparison of different methods of bio-assaying gonadotropic hormones, vaginal opening of the rat was found unreliable. Ovarian weight in the immature rat indicated the amount of follicle-stimulating hormone present but did not permit evaluation of the luteinizing factor. The criteria suggested are the smallest amount of material which produces full growth of six follicles and that which produces contiguous corpora lutea. The use of ovarian values seems to present the most comprehensive picture of the gonadotropic forces at work.

The biological assay of the mammogenic duct growth factor of the *anterior pituitary*, A. A. Lewis, C. W. Turner, and E. T. Gomez. (Mo. Expt. Sta.). (*Endocrinology, 24 (1939), No. 2, pp. 157–164, figs. 5*).—As a result of *tests of the proliferation of the mammary glands of immature, normal, and* castrated ♂ mice induced by daily doses of androgens and anterior-pituitary tissues from pregnant cattle, a test was devised for assaying mammogen. Large doses of gonadotropic hormone did not stimulate mammary development. The proposed method involved determination of the total amount of tissue or extract required to produce definite signs of development in one or more glands of 50±10 percent of 10 ♂ albino mice weighing from 10 to 25 gm. Injections were made on 6 consecutive days, and the test animals killed on the seventh.

Evidence of hyperfunction of the anterior pituitary in a strain of rats, B. K. Harned and V. V. Cole (*Endocrinology, 25 (1939), No. 5, pp. 689–697, figs. 2*).—Rats of the Wistar and Yale strains grown under similar conditions were found to show significant differences in that the Yale rats exhibited a higher fasting blood sugar, a lower glucose tolerance, a greater hyperglycemic response to epinephrine, an initial resistance to insulin, a larger volume of urine per unit of body weight, a more rapid growth and larger size, a greater incidence of sterility, and a higher percentage of body fat. These differences seem to be due to hyperfunction of the anterior pituitary in the Yale strain.

The preparation of pituitary growth hormone free from lactogenic and thyrotropic hormones, D. L. Meamber, H. L. Fraenkel-Conrat, M. E. Simpson, and H. M. Evans. (Univ. Calif.). (*Science, 90 (1939), No. 2323, pp. 19, 20*).—It was found that 100 units of untreated growth hormone contained from 5 to 10 units of lactogenic hormone and from 100 to 150 units of thyrotropic hormone,

whereas treatment of a similar amount with cysteine reduced the lactogenic and the thyrotropic hormones to less than 1 unit of each.

Chemical fractionation of the gonadotropic factors present in sheep pituitary, H. JENSEN, M. E. SIMPSON, S. TOLKSDORF, and H. M. EVANS. (Univ. Calif.). (*Endocrinology, 25 (1939), No. 1, pp. 57–62*).—A brief description is given of the physiological behavior of follicle-stimulating and interstitial-cell-stimulating fractions of sheep pituitary extracts. Synergism, luteinization, and antagonism were secured by the simultaneous administration of the two fractions.

Action of ketene on the pituitary lactogenic hormone, C. H. LI, M. E. SIMPSON, and H. M. EVANS. (Univ. Calif.). (*Science, 90 (1939), No. 2328, pp. 140, 141*).—Acetylation of lactogenic preparation for 5 min. at 20° C. was found to negate completely the lactogenic activity expressed in squabs.

Endocrine control of the motility of the male accessory genital organs, T. MARTINS and J. R. VALLE (*Endocrinology, 25 (1939), No. 1, pp. 80–90, figs. 10*).—Study was made of the activity of ♂ genital organs removed from normal, castrated, and sex-hormone-injected rats and following the administration of certain drugs. It appeared that the sex hormones regulate the motility of the smooth musculature of the accessory genital organs. However, the ♂ hormone in rats has an inhibiting action in vitro on the contractility and excitability of the vasa deferentia, seminal vesicles, and prostates.

The effect of castration on tubal contractions of the rabbit, as determined by the Rubin test, S. WIMPFHEIMER and M. FERESTEN (*Endocrinology, 25 (1939), No. 1, pp. 91–95, figs. 2*).—After castration of ♀ rabbits, the tubal contractions were less frequent and weaker but were made stronger and more frequent by the administration of the oestrogenic hormones. Effects of progesterone were somewhat irregular. Castration caused the tubal mucosa to become atrophic but was hypertrophied following injections of oestrogenic hormone and progesterone.

The rate of increase in hypophyseal gonadotropic content following ovariectomy in the rat, with observations on gland weights, H. D. LAUSON, J. B. GOLDEN, and E. L. SEVRINGHAUS. (Univ. Wis.). (*Endocrinology, 25 (1939), No. 1, pp. 47–51, figs. 3*).—The gonadotropic potency of the pituitaries of ♀ rats was increased 3.7, 7, 20.7, 31.2, 52.7, and 51.9 times, respectively, by ovariectomies of 5, 10, 20, 30, 60, and 120 days' duration. Some effects on other endocrine glands were also noted.

Immunologic investigation of hypophyseal mammotropic preparations, H. W. BISCHOFF and W. R. LYONS. (Univ. Calif.). (*Endocrinology, 25 (1939), No. 1, pp. 17–27, figs. 4*).—The crop-stimulating effect of beef and sheep mammotropin was neutralized with sufficiently high dosages of antimammotropin serum prepared in rabbits against the hormone material from beef or sheep.

The gonadotropic content of the hypophysis throughout the life cycle of the normal female rat, H. D. LAUSON, J. B. GOLDEN, and E. L. SEVRINGHAUS. (Univ. Wis.). (*Amer. Jour. Physiol., 125 (1939), No. 2, pp. 396–404, figs. 2*).—The pituitaries from 248 ♀ rats ranging in age from 14 days to 2.5 yr. were assayed by the uterine method on 22-day-old test rats for gonadotropic hormone content. The pituitary potency rises to a peak at 21 days of age and decreases gradually until the onset of puberty, when it drops to about one-half of the prepuberal level. Evidently the adult gland stores little of its gonad-stimulating complex but releases it as rapidly as formed. During senility, the potency markedly increases as the ovaries fail.

The effect of cysteine on gonadotropic hormones, H. FRAENKEL-CONRAT, M. E. SIMPSON, and H. M. EVANS. (Univ. Calif.). (*Jour. Biol. Chem., 130 (1939), No. 1, pp. 243–249*).—Cysteine completely inactivated gonadotropic hor-

mones from the hypophysis and urine, whereas neither the principle from human pregnancy urine nor pregnant-mare serum showed loss of potency as a result of treatment with this substance.

The somatic growth-depressing effect of testosterone propionate, H. S. RUBINSTEIN, A. A. KURLAND, and M. GOODWIN (*Endocrinology, 25 (1939), No. 5, pp. 724–728, fig. 1*).—Daily intraperitoneal administration of 1 mg. of testosterone propionate to ♂ rats from 26 to 80 days of age significantly inhibited growth in body length and weight. The effect seems to result from inhibition of growth hormone production by the pituitary.

The colchicine test as a method for determining the time of onset and the duration of action of male active substances, R. TISLOWITZ (*Endocrinology, 25 (1939), No. 5, pp. 749–753*).—The use of colchicine was found to permit a more accurate study of the effect of testosterone propionate on mitoses in the seminal vesicle of young castrated ♂ mice. The first profuse formation of mitosis was observed in from 24 to 25 hr. after injection of 150γ of testosterone and from 27 to 31 hr. after injection of 180γ of testosterone propionate. Activity was maintained after 58 hr.

Responses of the female to male hormone substances, with notes on the behavior of hens and newly-hatched female chicks, J. B. HAMILTON and W. R. C. GOLDEN (*Endocrinology, 25 (1939), No. 5, pp. 737–748, figs. 4*).—The administration of testosterone propionate to newly hatched ♀ chicks or to hens was followed by definite cocklike behavior, including crowing. Crowing behavior was not proportional to comb growth. ♀♀ responded to testosterone propionate to a lesser degree than ♂♂.

The physiology of the reproductive system of the fowl, E. A. HEWITT. (Iowa State Col.). (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. 749, pp. 201–210*).—A general discussion.

A Rhode Island Red pullet with two oviducts, J. P. QUINN, W. H. BURROWS, and E. H. MCNALLY. (U. S. D. A.). (*Poultry Sci., 18 (1939), No. 5, pp. 381–384, figs. 2*).—A Rhode Island Red pullet having two oviduct orifices was found to have two oviducts but only one functional ovary. Insemination through the right orifice proved ineffective.

The relation of size of clutch and position of the egg in the clutch to hatching results, E. M. FUNK. (Mo. Expt. Sta.). (*Poultry Sci., 18 (1939), No. 5, pp. 350–353*).—A study of the fertility and hatchability of eggs laid by the station flock in 1935 and 1936 showed that those laid in single egg clutches were less fertile and did not hatch as well as those laid in clutches of 3, 4, 5, and 6 eggs. However, position within the clutch did not seem to be related to fertility or hatchability.

An avian semen collector, J. E. PARKER. (Mo. Expt. Sta.). (*Poultry Sci., 18 (1939), No. 6, pp. 455, 456, figs. 2*).—A device is described for collecting semen from ♂ birds allowed the freedom of the breeding pen.

Auto-sex linkage in the Barred Plymouth Rock, F. N. JEROME (*Poultry Sci., 18 (1939), No. 6, pp. 437–440, figs. 6*).—Sexing chicks at hatching by using the character of the head spot, the shank and foot color, and the down color of Barred Plymouth Rock chicks was found possible in an Ontario strain with an accuracy of over 95 percent.

The sex ratio in dogs maintained under similar conditions, L. F. WHITNEY. (Ala. Polytech. Inst.). (*Jour. Hered., 30 (1939), No. 9, pp. 388, 389*).—Data are presented on the sex ratio of 1,440 dogs born to parents kept under relatively uniform conditions. In all, the sex ratio was 124.3 ♂♂ to 100 ♀♀, but puppies conceived in the warm months were 116 ♂♂ to 100 ♀♀, as contrasted with 143 ♂♂ to 100 ♀♀ for pups conceived during the colder months.

FIELD CROPS

[Farm crops studies in Mississippi] (*Miss. Farm Res.* [*Mississippi Sta.*], 2 (1939), *Nos. 10, pp. 1, 2, 3, 4, 5, 6, 8, fig. 1; 11, pp. 1, 2, 3, 4, 5, 6, 8, figs. 2*).—Results are briefly noted of experimental work on the following topics:

No. 10.—Cotton Characteristics—Money Value, Staple Length, Gin Turn-Out, by J. W. Neely and H. C. McNamara; Phosphate Stimulates Hay Yield, by H. W. Bennett; harvesting sweetpotatoes, by W. S. Anderson; variety tests with cotton, corn, soybeans, wheat, oats, rye, barley, and sweetpotatoes for starch; fertilizer tests with cotton and sweetpotatoes; Minimum of Work for Good Seedbed, Clean Crops, More Profitable Than Maximum Preparation, Cultivation; and Economical Cotton by Winter Legumes in Stoneville Tests, by R. Kuykendall.

No. 11.—*Sericea* Lespedeza Leads Test, by E. B. Ferris; Good Farming Required for Profitable Yields of Sugarcane Sirup, by J. C. Robert; weed control requires regular attention, by H. W. Bennett; Corn Hybrids Show Degree of Promise in Stoneville Tests, by P. Gull; Plant One Year, Cut Next, Increases Sericea Hay Yields, by H. W. Bennett; variety and fertilizer tests with cotton at the substations; use of sodium nitrate on winter legumes; soybean breeding and variety testing; corn varieties at Holly Springs and Raymond; effect of legumes on soil improvement and yields of cotton and corn; hybrid corn varieties; cultural tests with potatoes, sweetpotatoes, and lespedeza; sugarcane production; pasture experiments; and Tests Show Value of Several Sources Nitrogen Fertilizer [for Cotton], by R. Kuykendall.

[Field crops research in Oregon]. (Partly coop. U. S. D. A. et al.) (*Oregon Sta. Bul. 359 (1938), pp. 11, 12, 13, 14, 15, 16, 19, 20, 34–42, 48–51, 52, 58, figs. 17*).—Reports of progress and accomplishments are given from agronomic work (E. S. R., 78, p. 774; 81, p. 35) at the station and substations, including breeding work with wheat, oats, barley, and grasses and legumes; variety tests with wheat, corn, oats, barley, flax, field peas, potatoes turnips, mangels, alfalfa, and miscellaneous grasses and legumes; development of corn drying methods; crop rotations; fertilizer tests with alfalfa, wheat, silage corn, peas and barley for hay, and crested wheatgrass; seed production of grasses, sugar beets, and alfalfa; tillage experiments and rotations with wheat; and experiments on control of weeds in grain, lawn weeds, and Canada thistle and other noxious weeds. Superior varieties or strains of wheat, barley, oats, corn, alfalfa, clover, grasses, flax, and potatoes developed or introduced by the station are mentioned.

[Field crops work in Pennsylvania], D. E. Haley, C. F. Noll, H. B. Musser, J. W. White, C. J. Irvin, and E. L. Nixon (*Pennsylvania Sta. Bul. 382 (1939), pp. 10, 19–22, 26, 27, 35, 36, figs. 2*).—Progress results are reported from breeding work with potatoes, wheat, oats, and red clover; inheritance studies with oats; variety tests with wheat, corn (and hybrids), oats, barley, soybeans, alfalfa, and white clover in pastures; soil acidity tolerance of red clover strains; response of potato varieties to soil reactions and planting dates; potato and tobacco rotations; fertilizer experiments with tobacco, especially in regard to potassium content, and with fine turf; and on response in corn yields to nitrogen carriers on limed and unlimed land.

Sudan grass, millets, and sorghums in Oregon, H. A. Schoth and H. H. Rampton. (Coop. U. S. D. A.). (*Oregon Sta. Bul. 361 (1939), pp. 22, figs. 6*).—Practical information is given on the soil and climatic adaptations; cultural requirements; place in rotations; animal (including insect) pests and diseases; utilization variously for pasture, soiling and silage, hay and fodder, and as

seed crops; and varieties of Sudan grass, proso, foxtail millet, Japanese barnyard millet, sorgo, and grain sorghum.

Biochemical approach to grass problems, A. G. Norman. (Iowa Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 9, pp. 751–760, figs. 3*).—The aim of the biochemist in pasture research, as indicated by the author, is to be able to determine analytically the composition of the herbage in order that its value to the animal may be assessed and the consequences of particular management practices determined. The use of the newer analytical procedures and the breakdown of the pasture problem into the equivalent of pure cultural studies are illustrated by experiments on the changing composition of ryegrass and orchard grass with age and fertilizer treatment carried out at Rothamsted Experimental Station in 1935, 1936, and 1937.

Research on grassland, forage crops, and the conservation of vegetation in the United States of America, R. O. Whyte (*Imp. Bur. Pastures and Forage Crops [Aberystwyth], Herb. Pub. Ser. Bul. 26 (1939), pp. 113, pl. 1, figs. 4*).—A summary of research activities on problems relating to the improvement of pastures and range lands, production of forage crops, and utilization of grasses and other vegetation in the conservation of soil in the United States in progress under auspices of the U. S. D. A. Bureau of Plant Industry, Forest Service, and Soil Conservation Service in the United States, Puerto Rico, and the Virgin Islands; the U. S. Golf Association; the Carnegie Institution of Washington; and the several State experiment stations. Subjects and genera are indexed.

The temporary ley, R. G. Stapledon (*Welsh Plant Breeding Sta., Aberystwyth [Bul.], Ser. H. No. 15 (1930–1937), pp. [8]+150, figs. 27*).—Pasture experimentation supplementing and elaborating that noted earlier (E. S. R., 60, p. 638) is reported in articles entitled Temporary Leys—Comparison of Station-Bred and Commercial Grasses Used in Simple Mixtures, by W. Davies (pp. 1–24); An Experiment on the Yield and Persistency of Strains of Grass and Clover Species Grown in Mixtures, and an Experiment on the Blending of Species in Simple Mixtures, by W. E. J. Milton (pp. 25–39); Pasture Management and Its Effects on the Sward, by I. Jones (pp. 40–129); and The Establishment and Maintenance of Temporary Leys, by R. G. Stapledon (pp. 130–150).

Pasture improvement in eastern Canada (*Canada Dept. Agr. Pub. 602 (1938), pp. 70, figs. 20*).—The importance of pasture, the types used, and climatic, soil, and plant variations involved in eastern Canada are described, and features and findings are reported from research by the Dominion experimental farms, especially with fertilizers, management, renovation, species and seed mixtures, and the composition and feed value of pasture herbage. Practical recommendations are given on management and improvement practices and on utilization of pasture by different classes of livestock and their management on pasture.

The use of crop residues for soil and moisture conservation, F. L. Duley and J. C. Russel. (U. S. D. A. and Nebr. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 8, pp. 703–709, figs. 2*).—Crop residues, e. g., straw of small grain, left on the surface of the ground appeared to be a very effective and practical method of conserving soil and soil moisture in the Great Plains, greatly increasing infiltration and reducing run-off and evaporation from the surface soil and reducing the amount of water and wind erosion. For storing and conserving moisture in the soil, protecting the land with plant residues when plentiful may be much more effective than clean or "black" fallow currently used throughout the regions of low rainfall. When cornland was protected by straw applied between the rows, the gain in moisture storage and in yields of air-dry fodder per acre over the yields from plowing and basin listing increased as the rate of application rose from 2 to 4 to 8 tons per acre.

The effect of height and frequency of cutting alfalfa upon consequent top growth and root development, S. C. Hildebrand and C. M. Harrison. (Mich. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 9, pp. 790–799, figs. 4*).—When alfalfa was cut often and close to the crown, food reserves in the roots were depleted and yield of hay and vigor of the plants decreased markedly. Frequent cutting of alfalfa at a high level (12 in.) resulted in decreased yields owing to loss of leaves due to maturity of the plant and lack of vegetative growth. The crop remained vigorous when cut back to a 6-in. level either biweekly or monthly, but at a 1-week interval between cuttings the plants failed to store food enough for maintenance over unfavorable periods. Cutting back to a 9-in. level gave good yields of top growth and roots with cuttings every week or 2 weeks, whereas monthly cutting intervals allowed plants to mature, resulting in a retardation of vegetative growth. Cutting at 12 in. resulted in abundant food storage, yet the yield of top growth above 12 in. was relatively low due to the maturing of the tops below that level. See also an earlier note (E. S. R., 81, p. 777).

Effects of soil temperature, pH, and nitrogen nutrition on the development of Poa pratensis, R. A. Darrow. (Univ. Ariz.). (*Bot. Gaz., 101 (1939), No. 1, pp. 109–127*).—Kentucky bluegrass grown at soil temperatures of 15°, 25°, and 35° C. produced at 15° (59° F.) a tall, succulent, bushy top growth with many leaves and at 35° an erect, nonsucculent, short top growth with few leaves. Root systems were large, white, succulent, and coarsely branched on low-temperature plants and small in diameter, light brown, and densely tufted on high-temperature plants. Plants grown with ammonium nutrition showed their best leaf, rhizome, and root development at pH 6.5, whereas nitrate plants showed little difference within pH 4.5 to 6.5. The latter were superior in leaf, rhizome, and root development to ammonium plants under the temperature and pH conditions. Bluegrass at constant temperature and pH and clipped weekly at 1- and 2-in. heights yielded more with nitrate than with ammonium nutrition, and over 11 weeks yields were greatest with clipping heights of 2 in.

The growth of Kentucky bluegrass and of Canada bluegrass in late spring and in autumn as affected by the length of day, M. W. Evans and J. M. Watkins. (U. S. D. A. and Ohio Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 9, pp. 767–774, figs. 2*).—Bluegrass plants were grown from May 17 to July 6, 1937, under natural lengths of day and with 18 and 8.5 hr. daily illumination. The mean daily temperature was 67° F. and the average length of the natural photoperiod 15 hr. A similar experiment followed from September 20 to November 26, 1937, when the mean daily temperature averaged 52° and the length of day 11.2 hr. Under the relatively long days of late spring and early summer on both species the shoots were nearly upright, internodes became elongated, and inflorescences developed on some shoots. Likewise, on plants illuminated 18 hr. daily, irrespective of seasonal temperature differences, the shoots grew upright or nearly upright and relatively long. In spring, particularly on Canada bluegrass plants, a large proportion of the shoots produced inflorescences. On plants grown under the relatively short days of fall or under 8.5 hr. daily illumination, the shoots grew decumbent or semidecumbent, stem internodes were not elongated, and few or no inflorescences developed. The difference in the seasonal growth of the rhizomes of these grasses appeared due largely to the tendency for Kentucky bluegrass rhizomes to develop in greatest numbers under relatively long days, as in late spring and early summer, and for the rhizomes of Canada bluegrass to grow in largest numbers under short days, as in late fall and early spring.

Harvesting buffalo grass seed for individual use, H. O. Hill. (Tex. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 9, p. 821, fig. 1*).—Buffalo grass seed was harvested in late June at the rate of about 1 lb. per man-hour cleaned unhulled weight by the use of a slightly modified lawn mower.

The cottons of Egypt, H. A. Hancock (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 235 (1939), pp. [4]+23, figs. 5*).—Recent trends in the Egyptian cotton crop as to staple length, yield, grade, and uniformity of staple are indicated, and staple characters, quantities of cotton available, yarn strength, and counts spinnable are tabulated and discussed for different varieties and grades. The chief control measures adopted for improvement of the crop are reviewed briefly, and government publications on cotton are listed.

Variations in the composition and grade of cottonseed produced in the States of Alabama, Georgia, North Carolina, and South Carolina, crop years of 1934–35 to 1937–38, G. S. Meloy (*U. S. Dept. Agr., Agr. Market. Serv., 1939, pp. [1]+20+[8]*).—During the period covered the oil content of cottonseed produced in the four States ranged from 12.8 to 24.1 percent, the average range being from about 14 to 21.8 percent, or an average difference of 155 lb. of oil per ton of seed. The protein content varied, in terms of ammonia, from 2.65 to 4.61 percent, and the average variation was from 2.92 to 4.37 percent ammonia, indicating a range of yields of cake of 41.13 percent protein content of from 686 to 1,027 lb. per ton of seed. Report is made also on variations in deterioration and adulteration, below grade and premium grades, and the basis of price in graded and ungraded markets. Public notices establishing grades, standards for grades, and methods of sampling, analyzing, and grading cottonseed sold or offered for sale for crushing purposes within the United States are appended.

Seed-flax production in Oregon, D. D. Hill (*Oregon Sta. Cir. 133 (1939), pp. 20, figs. 5*).—The soil and climatic adaptations of seed flax, producing districts, and cultural methods and field practices involved in growing it are described, with discussion of the status of the crop in the United States and Oregon, when profitable to grow, insect pests and diseases and their control, and the quality of Oregon flaxseed.

Flax has good possibilities as a cash crop in western Oregon, in the Blue Mountain region, and in some irrigated districts but is not recommended for the Columbia Basin section except for experimental plantings. The yield of flaxseed needed to produce a return equivalent to a given yield of grain was observed to vary widely from season to season. Tables and charts show the yields needed to produce equivalent returns, 1929–38. In oil content, Oregon flaxseed has been comparable to but in drying power it has surpassed that produced in other flax-growing sections of the United States.

Seed flax is adapted to most soil types in Oregon except very sandy soils. In areas of high temperatures, heat canker may cause serious injury unless the soils have plenty of moisture and organic matter, but its control is aided by early planting which results in larger yields in most sections. Cultural practices indicated from experiments in different localities included planting on a well-prepared seedbed after a legume, or, when flax worm is present, after a cultivated crop; and planting early, according to the locality, at the rate of from 30 to 35 lb. per acre in the Willamette Valley and in eastern Oregon and from 40 to 50 lb. on irrigated lands along the Lower Columbia. The Bison variety is indicated for western Oregon, Rio in eastern Oregon, and Redwing for the diked lands along the Columbia. The crop may be harvested like small grain.

Northern Georgia as a source of fall crop certified seed potatoes for certain sections of the South, H. L. Cochran and J. E. Bailey. (Ga. Expt. Sta.). *(Amer. Potato Jour., 16 (1939), No. 10, pp. 266–273).*—Cultural methods, field practices, and varieties involved in growing certified potatoes in northern Georgia for seed in Florida and other parts of the South are described, with comments on environmental conditions and data on increased yields due to heavier seasonal precipitation and spraying with bordeaux. Bliss Triumph seed from north Georgia equaled or surpassed that from certain northern States.

Potato variety and seedling trials in Rhode Island, T. E. Odland and T. R. Cox. (R. I. Expt. Sta. and U. S. D. A.). *(Amer. Potato Jour., 16 (1939), No. 10, pp. 251–259).*—Chippewa, Houma, and Sebago potatoes showed promise in prolonged tests, whereas Katahdin and Golden had certain undesirable features. Indications were that Sebago and several other seedlings are much more resistant to scab than are Green Mountains. Records on susceptibility indicated that definite progress is being made in attempts to develop varieties more resistant to early and to late blight.

Fertilizer requirements of the potato on different soils of Alabama, L. M. Ware. (Ala. Expt. Sta.). *(Amer. Potato Jour., 16 (1939), No. 10, pp. 259–266).*—Fertilizer tests with potatoes, 1931–35, on five soil series and in five localities indicated that in general 60 lb. of nitrogen, 150 lb. of phosphoric acid, and 90 lb. of potash per acre, 4, 10, and 6 percent, respectively, on a 1,500 lb. per acre basis would be adequate. Yield responses suggest raising the potash to 120 lb., and the nitrogen to 90 lb. on certain soils and to 135 lb. on new ground (E. S. R., 76, p. 626) the first year after clearing and 90 lb. subsequently. In south Alabama it was shown (E. S. R., 80, p. 42) that the continued use of a summer legume following potatoes will result in a higher production level and a reduced commercial nitrogen requirement.

Growth habit of some winter wheat varieties and its relation to winterhardiness and earliness, K. S. Quisenberry and B. B. Bayles. (U. S. D. A.). *(Jour. Amer. Soc. Agron., 31 (1939), No. 9, pp. 785–789, fig. 1).*—Growth habit as determined from spring seedings of 28 wheat varieties was studied at 8 western experiment stations 1934–36. Data on earliness from fall sowing and winter survival from other tests are included for their relation with the degree of winterness. The varieties ranked in about the same order for degree of winterness when grown at each of the stations. Degree of winterness was not related closely to time of heading from fall seeding or to winterhardiness in these varieties. None of the early varieties were as hardy as most of the late ones, yet a few of the late varieties were no hardier than earlier maturing wheats.

Grasshopper injury in relation to stem rust in spring wheat varieties, R. W. Smith. (U. S. D. A. and N. Dak. Expt. Sta.). *(Jour. Amer. Soc. Agron., 31 (1939), No. 9, pp. 818–821).*—Cereal crops at Dickinson, N. Dak., ranked in extent of grasshopper injury in the descending order of barley, oats, wheat, corn, and sorghum. Certain spring wheat varieties were injured more than others, particularly badly rusted wheats. In three different nursery groups of spring wheat the respective correlations between percentage of stem rust and percentage of grasshopper injury were $r=0.512\pm0.033$, 0.767 ± 0.028, and 0.787 ± 0.016. Reasons for the greater damage to rusted varieties are suggested.

Starch content of certain wheats of the 1935 crop, C. Y. Hopkins *(Canad. Jour. Res., 17 (1939), No. 9, Sect. B, pp. 253–257, figs. 3).*—Analysis of average samples of 12 grades of Western Canadian wheat (1935 crop) for starch by a polarimetric method showed that the ordinary milling grades, in which Marquis predominated, contained from 50 to 52 percent of starch on a basis of 13.5 percent moisture, and Garnet wheat contained about 55 percent starch.

Rusted wheat had a lower starch content. A positive correlation was noted between starch content and specific gravity of the kernels. The sum of the starch and protein was related closely to the flour yield.

A simple measure of kernel hardness in wheat, J. W. Taylor, B. B. Bayles, and C. C. Fifield. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 9, pp. 775-784, figs. 3*).—A simple pearling test, devised for measuring the hardness of wheat kernels, is described as economical in equipment, time, and quantity of grain. Results were consistent with known facts on the relative hardness of different varieties, and very high interstation correlations were obtained. High correlation coefficients were found between percentage of the kernels pearled off and particle size index, and slightly lower negative coefficients between this percentage and doughball time. However, certain varieties reacted quite differently to the two tests. Little correlation was found between percentage pearled off, particle size index, doughball time, and protein content of the grain of the varieties studied.

[**Seed testing research**] (*Compt. Rend. Assoc. Internatl. Essais Semences (Proc. Internatl. Seed Testing Assoc.), 1939, No. 1, pp. 1-43, 48-56, figs. 7*).—Papers on different phases of seed testing and control include Yellow Clover (*Medicago lupulina* L.) of Swedish Origin [trans. title], by H. Witte (pp. 1-4); A Study of the Rate of Occurrence of Certain Weed Seeds in Replicate Analyses of the Seed of Timothy (*Phleum pratense*), by M. E. Woodbridge (pp. 5-24) (N. Y. State Expt. Sta.); Contributions to the Study of the Statistics of Seed Testing—VII, Further Studies on the Distribution of Particles Differing in Specific Gravity or Size (pp. 25-39), and Contribution to the Study of the Statistics of Seed Testing—Addendum to Isoprobes for the Poisson Distribution (pp. 40-43), both by C. W. Leggatt; Decolorized Red Clover Seed, by A. Grisch (pp. 48-50; Fr., Eng. abs. pp. 49, 50); and Germination of Some *Brassica* Types at Different Temperatures, by E. H. and V. K. Toole (pp. 51-56) (U. S. D. A.).

Statistical aspects of seed analysis, C. W. Leggatt (*Bot. Rev., 5 (1939), No. 9, pp. 505-529*).—The review covers 22 titles.

Influence of low temperature treatments on the germination of seeds of sweet clover and smooth vetch, L. E. Dunn. (Oreg. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 8, pp. 687-694*).—Seed of sweetclover and smooth vetch were stored from 1 to 10 mo., moist and dry, at room temperature (average 22° C.), 5°, −10°, −10° for 1 week followed by continuous storage at 5°, and alternations in weekly intervals between temperatures above and below freezing. No low temperature storage treatment caused the seed to give higher germination percentages than seed stored dry at room temperature. Moist storage under various low and alternating temperature conditions was harmful to germination. Permeable seeds produced radicles slowly in low temperature storage slightly above freezing, and permeable seeds absorbing enough water to swell slightly were injured or killed by freezing. Dry storage under like conditions had no influence on germination. Hard seeds of sweetclover after from 1 to 10 months' storage were not softened significantly by the various treatments. However, the treatments were effective in softening hard seeds of smooth vetch; after 6 months' storage only about 20 percent of the original hard seeds remained impermeable. Hard seeds which had softened germinated normally when they were not frozen after taking up water. Probably most hard seeds of smooth vetch would germinate and produce plants within the first 2 or 3 mo. after planting.

Seed inspection in Kentucky, 1938–1939, W. A. Price, E. C. Vaughn, E. Dixen, H. Tilson, H. T. Shacklette, A. McDaniel, K. Fried, and M. Morton (*Kentucky Sta. Regulat. Ser. No. 20 (1939), pp. 30*).—The purity and germination

percentages and presence of excessive quantities of noxious weed seed are reported for 586 official samples of agricultural seed obtained from dealers during the year ended June 30, 1939.

[**Seed and weed investigations**] (*New York State Sta. Rpt. 1939, pp. 35, 36, 37*).—The characteristics of official samples of field crop seed and special seeds mixtures are pointed out, and the progress of control field plantings of seed stocks, weed seed studies, and investigation of relative tolerances of domestic and foreign red clover seed to X-rays are reported briefly.

The nitrification of ammonium thiocyanate (a weed eradicant) and the effect of this compound upon the soil population, A. G. SANDHOFF and C. E. SKINNER. (Minn. Expt. Sta.). (*Soil Sci., 48 (1939), No. 4, pp. 287-294*).—When used on soil in quantities comparable to field practice in weed control, ammonium thiocyanate (E. S. R., 67, p. 130) increased the number of bacteria and had no harmful effects on soil algae or protozoa even when used in excess. Quickly available nitrogen was formed only to one-half of the nitrogen in the compound. The ammoniacal nitrogen could be accounted for largely as nitrates.

Matrimony vine and lily-of-the-valley vine as weed pests, M. K. BELLUE (*Calif. Dept. Agr. Bul., 28 (1939), No. 5, pp. 293-297, figs. 2*).—Matrimony-vine (*Lycium halimifolium*) and lily-of-the-valley (*Salpichroa rhomboidea*), undesirable aggressive weeds in gardens and waste places, with vigorous root systems, are described and their distributions shown.

Practical lawn craft, R. B. DAWSON (*London: Crosby Lockwood & Son, [1939], pp. 300, [pls. 21], figs. [11]*).—Turf information, based largely on experiments by St. Ives Research Station (Yorkshire) and others, covers the status, ideals, and establishment and maintenance of lawn and turf, turf for sports and other purposes, and turf upkeep in countries other than Great Britain. Data on the composition of fertilizers and dimensions of sports fields are appended.

HORTICULTURE

[**Horticultural studies by the Mississippi Station**] (*Miss. Farm Res. [Mississippi Sta.], 2 (1939), Nos. 10, pp. 4, 6; 11, pp. 1, 4, 5, 6, 7, 8, figs. 3*).—Included in No. 10 are brief reports of progress in 1938–39 on studies relating to sweet corn varieties; varieties and culture of pickling-type cucumbers; varieties of tomatoes; pruning, staking, and spacing of tomatoes; time of planting lettuce; fertilizing spinach; varieties of lima and pole snap beans; varieties of apple, plum, pear, grape, and berries; and effects of modifying day length on the flowering of the chrysanthemum. In No. 11 information is presented on fruit varieties for home orchards, and behavior of various fruits at the Delta Substation, by G. A. Currey; cultural and fertilizer requirements of the tung-oil tree, and influence of temperature on tung nut production at the South Mississippi Substation; variety and fertilizer trials with vegetables at the Truck Crops Substation; and 1939 varietal and fertilizer experiments with tomatoes. Of the numerous tomatoes tested, a strain of Gulf States Market led in the production of U. S. No. 1 fruits, followed closely by a strain of Louisiana Pink. Of fertilizers for tomatoes, those containing liberal percentages of N and P appeared most beneficial.

[**Horticultural studies by the New York State Station**]. (Partly coop. U. S. D. A.). (*New York State Sta. Rpt. 1939, pp. 28-32, 33-35, 38-41*).—Among projects the progress of which is discussed are variety tests with fruits; breeding of fruits; the use of colchicine in the development of polyploid forms of plants; stock experiments with cherries; the use of the Malling group of rootstocks; the grafting of mazzard and mahaleb cherry seedlings; the use of

peat moss as a soil supplement for planting fruit trees; peach thinning; the culture of peach embryos; orchard soil management; grape culture by the Fredonia Laboratory; culture and fertilization of fruits in the Hudson River Valley; varieties of hops; testing of vegetable and flower seeds; placement of fertilizers in vegetable culture; the use of starter solutions in the transplanting of tomatoes; methods of fertilizing cabbage; fertilizers for beets; tomato, muskmelon, and squash breeding; the use of hybrid sweet corn varieties; varieties of peas for freezing and canning; local v. southern tomato plants; canning varieties of tomatoes; and rates of seeding and distance of planting sweet corn.

[Horticultural studies by the Oregon Station]. (Partly coop. U. S. D. A.). (*Oregon Sta. Bul. 359 (1938), pp. 16, 42, 43, 44–46, 52, 60, 61, 62, 71–73, 74, 75, 78, 87, 89, 90, 94–96, figs. 10*).—Included are brief reports on the following investigations: Use of ethylene for the defoliation of nursery stock; factors affecting the cost of producing hops; the drying of hops; culture of pyrethrum; pollination of the Bartlett pear; use of wax and wraps for protection of pears during storage; development of new uses for pears; relation of ethylene gas to the ripening of fruits; varietal tests of tree fruits; low temperature as a cause of injury in the Montmorency cherry; use of hardy varieties as intermediate trunks for apples, pears, and cherries; strawberry breeding; testing of red strains of apple; irrigation of the pear; relation of soil fertility to set of Anjou pear; raspberry breeding; pruning and training of the youngberry and red raspberry; causes of shriveling of walnut kernels; nutritional needs of the walnut; varietal trials of vegetables for freezing preservation; sprinkler irrigation of tomatoes; storage and handling of nursery stock; ethylene as a factor in the premature defoliation of holly; and the use of growth-promoting substances in nursery plant propagation.

[Horticultural studies by the Pennsylvania Station], J. W. SINDEN, H. K. FLEMING, R. D. ANTHONY, F. N. FAGAN, C. O. DUNBAR, W. B. MACK, E. M. RAHN, G. J. STOUT, C. E. MEYERS, M. T. LEWIS, and R. P. MEAHL (*Pennsylvania Sta. Bul. 382 (1939), pp. 5, 35, 48–53*).—Among experiments, the progress of which is discussed, are the use of synthetic composts in mushroom growing; culture of mushroom spores; rooting of apple cuttings with the aid of growth-promoting substances; relation of elevation and exposure to low-temperature injury to fruit trees; wound dressings for fruit trees; soil management of peach orchards; variety and strain tests of vegetables; fertilization of vegetables under irrigation; granular fertilizers for vegetables; inbreeding of sweet corn; breeding of peppers, tomatoes, lettuce, and cabbage; breeding of snapdragons; asexual propagation of woody ornamentals; and variety tests of ornamentals.

Chemical gardening for the amateur, C. H. CONNORS and V. A. TIEDJENS (*New York: Wm. H. Wise & Co., 1939, pp. 255, [pls. 8, figs. 45]*).—This general treatise, based largely on experimental observations, presents in nontechnical language the more important features of the subject.

Some effects of winery distillery waste on soil and plants, E. L. PROEBSTING and H. E. JACOB. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 69–73*).—Investigations on the mixing of distillery waste in irrigation water as a means of disposal showed that the application of de-alcoholized residues to orchards and vineyards was a dangerous practice, usually resulting in the death of the plants unless highly diluted. Injury apparently is not due to toxic substances but rather to materials produced during the decomposition process in the soil under nearly anaerobic conditions. Direct evidence of organic poisons was lacking, although this possibility is not excluded. Concentrations of inorganic salts brought into solution from the soil by decomposition were shown to be suffi-

cient to kill potted plants in 24 hr. A soil rendered unfit for use in this manner in the fall of 1937 had lost its toxic properties, at least for sunflowers, to a depth of 4 ft. by the early autumn of 1938. It is deemed possible, however, that some permanent damage might have been done in the leaching of nutrients.

The **use of wax emulsions in reducing desiccation of transplanted tomato plants and apples in storage,** S. E. Jones and H. W. Richey. (Iowa State Col.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 751–753, figs. 3*).—The dipping of young 10-in. Bonny Best tomato plants in an emulsion consisting of 1 part of Dowax to 8 parts of water caused no burning of the foliage, and at the same time reduced the desiccation sufficiently to be of practical value for 2 days following treatment. The possible benefit of the treatment during transplanting to the field is suggested. The dipping of Gano and Grimes Golden apples in Dowax solution of 1 to 1, 1 to 2, and 1 to 4 parts of water resulted in burning at all concentrations, particularly in the Grimes Golden variety. Desiccation in storage was decreased by treatments, but there was an objectionable residue and the storage life at room temperature was shortened.

Evaluating quality changes in certain vegetables after harvesting, J. M. Lutz. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 754–759*).—From studies with peas, beans, and asparagus, the author concludes that chemical and physical determinations, such as used, cannot always be relied upon to give accurate information on characteristics such as color, texture, and flavor of certain vegetables after cooking, as influenced by after-harvest treatment of the products. It is recommended that vegetables suited to handling by freezing storage be held at freezing temperatures until cooking tests are made. This procedure is not set forth as a substitute for, but rather as a supplement to, chemical and physical methods.

The **importance of potassium in the growth of vegetable plants,** V. A. Tiedjens and M. E. Wall. (N. J. Expt. Stas.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 740–743*).—Rutgers tomato plants, grown in sand culture with nutrients supplied by the constant drip method, exhibited characteristic K-deficiency symptoms when the element was absent. The presence of Na had no effect in preventing the onset of K-deficiency symptoms. Plants receiving 40 p. p. m. of K in the nutrient solution produced the most dry matter and fruit and had the highest carbohydrate content in the leaves. At 20 p. p. m. of K the plants showed some leaf injury, were somewhat stunted, and did not set fruit well. Below 20 p. p. m. there was severe leaf break-down. Since plants receiving 8, or 20 p. p. m. of K showed little or no Ca deficiency while those above 20 p. p. m. showed progressively severe Ca deficiency, the authors conclude that Ca and K antagonize each other and that the decrease in carbohydrate formation in cases of K deficiency may be due to injury of the protoplasm rather than to specific catalytic action of K.

Results from three methods of applying fertilizer to certain vegetables, F. Nettles. (Univ. Fla.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 505–508, figs. 2*).—Of three methods of distributing fertilizer—(1) mixing with the soil in the furrow, (2) broadcasting, and (3) in 2-in. bands 2 in. to the side of the seed and 2 in. below the seed—compared on six crops, beans, cucumbers, lettuce, peppers, potatoes, and tomatoes, none was consistently the best for all crops in all seasons. Plants of a short growing season, such as the cucumber, benefited by the application of fertilizer in or near the row. Long-season crops, such as the pepper and tomato, apparently were better able to utilize broadcast materials. The type, moisture-holding capacity, and moisture content of the soil were involved in the effectiveness of different fertilization practices. The distribution of the fertilizer seemed to influence the distribution of the roots,

which were found to grow vigorously in the areas where the nutrients were concentrated.

Observations on the effect of shade on vegetables, A. R. Trotter and A. E. Griffiths. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 550–554*).—Observing improved germination and development in spinach grown under heavy tobacco cloth, the authors repeated the experiment with radishes, lettuce, and endive. The average relative humidity was significantly higher under shade for the entire season from July 11 to October 14. Soil moisture at the 2- and 4-in. levels was consistently and significantly higher under shade. On a bright day, the average light intensity under cloth was approximately 53 percent of that outside. With all three species, germination was earlier and a more uniform stand was obtained under cover. All species developed larger and darker green leaves under cloth. Under shade, radish roots were larger, crisper, and more uniform in size and color. Endive attained market maturity much earlier, and the heads were larger and had better blanched hearts. Lettuce heads were larger but formed flower stalks sooner than when grown out-of-doors.

Control calendar for vegetable pests, E. F. Guba and W. D. Whitcomb. (*Mass. State Col. Ext. Leaflet 116, rev. (1939), pp. 24, figs. 13*).—Both insects and diseases are included.

***Soil acidity for greenhouse lettuce and tomatoes*, J. D. Hartman and E. C. Stair.** (Purdue Univ.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 715–719*).—The treatment of greenhouse soil, previously amended with peat and acid muck to improve the physical condition, with acidifying agents such as aluminum sulfate and sulfur caused no detrimental effects on the yield of lettuce and tomatoes except in the case of the high sulfur applied at the rate of 3,600 lb. per acre on August 15 and 2,400 lb. more per acre on January 4. The acid muck and peat treatment alone reduced the pH of the check plat from 7.8 to 6.7, but due to the alkalinity of the water (about 7.8) and probably also to particles of limestone in the soil there was a definite tendency to recover alkalinity. Because the soil below the 8-in. level was little influenced by acidifying agents, both species after establishment were able to draw on the deeper soil for nutrients. The soil used was high in manganese, giving a positive test for manganese at any pH. Essential elements except nitrogen apparently were present in sufficient amounts for good growth. Apparently the soil did not contain an abundance of slowly soluble aluminum or ferric iron. The solubility of calcium and magnesium was increased by the acidifying treatments.

Studies of mature asparagus plantings, with special reference to sex survival and rooting habits, A. F. Yeager and D. H. Scott. (N. Dak. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 513, 514*).—Observations in a 35-year-old asparagus planting showed many of the crowns to cover an area 5 ft. in diameter. Roots penetrated to a maximum depth of 6 ft. 6 in. The sex ratio in the two-thousand-odd plants was in the order of 2.5 staminate to 1 pistillate, which would indicate much greater mortality in the pistillate group. In a nearby 15-year-old planting, the ratio was 1.4 staminate to 1 pistillate. In three rows, one staminate, one pistillate, and one mixed, at the end of 12 cutting seasons, the yields were in the order of 123±8.7, 68.1±4.4, and 100 percent, respectively. During the first 2 yr. of cutting Barr Mammoth, Giant Argenteuil, Palmetto, and Mary Washington, the last-named variety produced nearly twice the yield of any other variety. After this time, for a period of 10 yr., the yields were not significantly different except for Palmetto, which produced significantly less.

Yield studies as related to asparagus breeding, G. C. Hanna. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 677–679, fig. 1*).—Yield records taken on 159 plants selected from a 400-acre field of 2-year-old Mary Washington asparagus and on 350 progeny plants obtained by intercrossing certain of the above showed considerable fluctuation in the relative standing of individuals from year to year. The data suggested that while it is generally true that plants which give high yields the first year will continue as high producers this cannot be accepted as an axiom. Certain plants increased, others decreased, and still others remained rather constant in yielding capacity with increasing age. There was some indication that under California conditions records should be taken for at least 7 or 8 yr. to avoid the use of short-lived plants as parents.

Viability of freshly harvested celery seed, J. Walker (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 687–690, fig. 1*).—In November, after exposure to freezing, five Golden Plume celery plants were potted and placed in a well-lighted greenhouse. The first seeds were harvested on May 27. Of three lots of 100 seeds taken from each plant, one lot was sown immediately, one was air-dried at room temperature for 2 weeks before sowing, and the third was placed in an electric refrigerator for 2 weeks at about 40° F. before sowing. Some evidence was secured that germination was delayed by the low temperature exposure. Air-drying the seed for 2 weeks had no great influence on viability, and the average final emergence counts for all treatments and all five mother plants were not significantly different.

Performance in Hawaii of tomato strains developed for the Southern States, J. E. Welch. (Hawaii Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 701–704*).—Of a total of 73 varieties and strains of tomato obtained from various sources, certain accessions secured from the U. S. Department of Agriculture (Florida) and from the Louisiana Station showed outstanding merit, being superior to Break O'Day and Pritchard, the two most widely planted commercial varieties in Hawaii.

Varietal, climatic, and age influences on daily cracking indices of tomato fruits, W. A. Frazier and J. L. Bowers. (Md. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), p. 746*).—Observations on two field-grown crops showed that Earliana and Grothen Red Globe tomatoes are highly susceptible to concentric cracking of the fruits. Marglobe and Dwarf Champion were susceptible to radial cracking, and Brown Special was comparatively resistant to both types. In 1937 cracking was initiated approximately 10 days prior to the pink stage of maturity. Daily cracking indexes increased up to the pink stage and were high for a few days thereafter. Cracking progressed daily, even when atmometric readings indicated continued evaporation. No consistent relation was found between daily growth increments and cracking indexes.

The absorption of nutrients by the tomato plant at different stages of growth, J. B. Hester (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 720–722, fig. 1*).—The results of analyses of samples collected at monthly intervals of the top growth of tomato plants growing on a Sassafras sandy loam showed that a large portion of the nutrients are absorbed in the second and third months after transplanting to the field. The nutrients absorbed in greatest quantity were K, N, and Ca. The desirability of applying nutrients in two or three applications was indicated. Considering the amounts of P, K, N, and Ca removed in the fruits, it was evident that a well-fertilized tomato crop should leave the soil in an improved state of fertility, provided the vines and plant debris are plowed under.

Use of nutrient solutions and hormones in the water for transplanting tomatoes and their effect on earliness and total yields, C. B. Sayre. (N. Y. State Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 732–736*).—Of 10 treatments, including water alone as a check, used at the rate of 1 pt. per plant at the time of setting in the field, the largest early yield and also the largest total yield of marketable tomatoes were secured with the solution of 20 gm. of Ammo Phos A and 10 oz. of nitrate of potash in 50 gal. of water. Costing approximately 48 ct. per acre, this treatment increased the early yield by 1.44 tons and the total yield by 1.85 tons per acre, despite the fact that the field was well fertilized. When 50 mg. of naphthaleneacetic acid were added to the above treatment, there was a depression of yield, particularly early yield. Where naphthaleneacetic acid or indolebutyric acid was used alone, the retarding of maturity was evident, leading the author to conclude that with the quantities and methods used, growth-promoting substances were not effective in increasing yields and tended to delay maturity. The use of small amounts of borax, manganese sulfate, and magnesium sulfate in the transplanting water did not increase yields.

The influence of certain phytohormone treatments on the time of flowering and fruit production of tomato plants under field conditions, H. L. Stier and H. G. duBuy. (Md. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 723–731, figs. 2*).—Treatment of Master Marglobe tomato seeds with auxin talc dust mixtures and the subsequent treatment of the plants with solutions of either indolebutyric or naphthaleneacetic acid at the time of transplanting to the field resulted in certain cases in marked acceleration in the time of anthesis of the flowers, larger yields during the first month of fruiting, and larger total yields of marketable fruits. The naphthaleneacetic acid was most effective in inducing early flowering when present in the dust in a concentration of 1,000 p. p. m. In greater concentrations this acid caused marked inhibition in the rate of seed germination and the time of flowering. The maximum acceleration in flowering and fruit production and the greatest total yield followed the treatment of 50 seeds with approximately 15 mg. of a dust mixture consisting of 10 mg. of naphthaleneacetic acid to 10 gm. of talc, followed by dipping the seedling roots in an aqueous solution of indoleacetic acid (10 p. p. m.) for about 2 sec. at the time of transplanting. The use of naphthaleneacetic acid solution as a transplant treatment in the concentration of 10 p. p. m. appeared to inhibit flowering and fruiting in the field except when indoleacetic acid was used as the dust mixture for treating the seeds. The authors suggest that the response obtained by the use of growth-promoting substances was probably greater than would have been obtained in a soil with a higher organic matter content and a higher level of fertility.

Growth, production, and fruit quality of tomatoes grown under cloth, F. A. Romshe. (Okla. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 692–694*).—In the case of Marglobe and Gulf State Market tomato plants grown in midsummer under Aster cloth, there was found an increase in the number of flowers developed per cluster and in the percentage of flowers which set fruit. The shaded plants produced a significantly larger number and greater total weight of fruits than did the unshaded. Sunscald and blossom-end rot were absent under the cloth. The coloring of tomatoes under the cloth was noticeably more uniform and of a deeper shade of red.

The effect of storage methods on ripening and quality of tomatoes, E. A. West and G. B. Snyder. (Mass. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 695–700*).—Seeking to extend the market season, the authors wrapped greenhouse-grown Comet tomatoes harvested in the pink-ripe and firm

red-ripe stages in cellophane, parchment, and tissue. In addition fruits were dipped in sodium borate solution and formaldehyde solution or coated with paraffin to cover the stem scars. The wax tip treatment yielded the firmest fruits after storage, but when the skin was removed the tissue-wrapped fruits were firmer. In a second test, in which all fruits were at the firm-red-ripe stage, the cellophane and washed cellophane lots were firmest with the skin unremoved, and the washed cellophane lot was also firmest after peeling. In this second test the loss in weight was least in a wax-coated lot. The immature fruits apparently lost much more moisture during storage than did the ripe fruits. In the first experiment the incidence of disease was twice as great in the ripe as in the immature lots. Phoma rot (*P. destructiva*) was the most destructive disease agent noted. Information is presented on the chemical changes occurring in the several lots.

The relation of leaf form to transpiration rate and drouth resistance in some deciduous fruits, V. W. KELLEY. (Univ. Ill.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 210–215, fig. 1*).—In studies with 21 species of deciduous fruits and nuts, those species with narrow leaves in proportion to length transpired on a unit area basis very slowly in comparison with those having broad leaves. For the most part, species with narrow leaves were those generally described by horticulturists as drought resistant. Recognizing that drought resistance may depend upon a number of factors, transpiration per unit area and leaf form are considered important in conserving or exhausting the water supply.

Response of fruit trees near The Dalles, Oregon, to applications of boron and zinc, C. E. SCHUSTER, O. T. MCWHORTER, and R. E. STEPHENSON. (U. S. D. A. and Oreg. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 99–101*).—From certain orchards in which trees showed a dwarfed, chlorotic condition of the leaves, samples of soil were collected at 1-ft. intervals to a depth of 10 ft. Sunflowers grown in the soils developed B-deficiency symptoms, with some exceptions in the surface-foot samples. The finding of 15 p. p. m. of B in commercial zinc sulfate used in spraying trees for "little leaf" suggested that B might be an active beneficial factor. Where badly affected trees were sprayed with chemically pure zinc sulfate, B, or a combination of the two, all were improved. However, only those receiving both zinc sulfate and B recovered completely. Observations in 1938 without further treatment again showed that the combined B and zinc sulfate treatment was the most effective, the trees of this group being normal or nearly normal in condition. Of the two elements, zinc sulfate was apparently of major and B of secondary importance, with both necessary for complete recovery.

[**Studies with apples by the Vermont Station**] (*Vermont Sta. Bul. 452 (1939), pp. 26–28*).—Among studies the progress of which is noted are spraying practices for Vermont apple growers and fertilization of apple orchards.

Inbreeding experiments with the apple, M. J. DORSEY. (Univ. Ill.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), p. 292*).—Of 5,468 seeds collected from 2,201 fruits, the net result of the self-pollination of 43,902 flowers, only 1,606 germinated. A total of 1,326 seedlings were planted, but 832 died or were otherwise eliminated before reaching 5 ft. in height. Of 128 seedlings which have fruited, some exhibited vigorous growth and fruited at a relatively early age. The third inbred generation was reached in certain lines.

Some apple tree stock relationships seen in New England after 1938 hurricane, F. B. LINCOLN. (Md. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 102–109, figs. 4*).—A study of the roots of large apple trees overturned by the New England hurricane of September 21, 1938, confirmed the premise that the crown of the tree has a dominating influence on the stock roots.

A second premise that the trunk of the tree is the part that gives specific properties to the stock roots was not well supported, inasmuch as McIntosh trees when top-worked on other varieties which in themselves were stable to the wind resulted in instability. Conflicting information was obtained with regard to the hypothesis that the erect-growing trees have deeply penetrating root systems. Northern Spy and Sutton were rooted firmly and Macoun and Yellow Transparent were not. The low-headed Rhode Island Greening was extremely resistant to the storm.

The nitrogen requirement of the apple, J. R. MAGNESS and L. O. REGEIMBAL (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, *35* (*1938*), *pp. 51–55*).—Based on determinations of the N content of the fresh fruit of nitrated and nonnitrated Delicious and York Imperial trees, it is estimated that in well-fertilized trees the N content of the fruit will range around 0.035 to 0.04 lb. per 100 lb. of fresh weight. On the basis of other researches, it is concluded that the N content of the seed per tree would total between 40 and 50 gm. and that of the abscising blooms about 40 gm. In a 25-year-old tree with as many as 200,000 leaves, the N contents in midsummer and at the time of leaf fall approximate 1.5 and 0.6 lb. per tree, respectively. Estimating the new wood laid down each year by a vigorous 20- to 25-year-old tree at 80 lb. dry weight, 0.12 lb. of N per year would be necessary for such growth. The total quantity of N taken up each year in the bark is approximately 0.09 lb. Based on the results of analysis of small and large roots of young and mature apple trees receiving different amounts of applied N, the authors suggest that, considering the root system as a whole, about 0.45 percent of the residual N is unavailable for translocation and utilization in other parts of the tree. Summing up, a total of 0.84 lb. of N may be removed permanently from the soil each year by a 25-year-old tree of good vigor, and, in addition, 0.69 lb. removed in the abscising blooms and leaves may ultimately be returned to the soil.

Nitrate movement in orchard soils in relation to time of application, L. P. BATJER and J. R. MAGNESS. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, *35* (*1938*), *pp. 49, 50*).—Analysis of soil samples collected in two orchards which, after removal of the sod, had been treated with definite amounts of nitrate of soda on different dates, showed similar movements of the nitrate in both areas. Rain to the extent of 8 in. within a month of the October 15 application was sufficient to carry most of the nitrate from the top foot of soil where root concentration was highest. There was little fixation of nitrate during the winter, as practically the total amount applied in October and November was recoverable in April. In the case of spring and summer applications, little of the nitrate was found below the upper foot, although the rainfall averaged 3 in. per month. Removal of moisture by evaporation and transpiration was apparently sufficient in the growing season to equal the rainfall and prevent downward movement of nitrates. No significant increase in N content of roots and twigs occurred before March in York Imperial trees on Hagerstown clay. On the other hand, in Delicious trees on Berks shale there occurred marked increases in the N content of the roots during the dormant season. It was obvious that if as much as 15 in. of precipitation fell during the dormant season the downward movement of nitrates was sufficient to carry most of the fall applications below the depth of effective root concentration before the spring resumption of growth.

Some responses of McIntosh apple seedlings growing with the roots in various concentrations of oxygen, J. I. DE VILLIERS. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, *35* (*1938*), *p. 86*).—Apple seedlings growing in jars sealed to prevent the entrance of air to the roots and basal parts were subjected to

in-N mixtures of different known O_2 concentrations, drawn through the sand or soil in a slow, continuous stream. Every response that could be quantitatively expressed showed the bad effects of poor aeration. Increased leaf area during treatment was only slightly less than normal when the roots were in 10 percent O_2, but only one-third of normal when the O_2 was reduced to 5 percent. At 1-percent O_2 there was an actual loss in leaf area. The weight of the entire plants, although not as sensitive an index as leaf area, reflected the depressing effects of poor aeration. Ash as expressed in percentage of dry weight decreased as the soil O_2 was decreased. Mineral absorption was as much reduced as root growth, and together with the latter formed the most sensitive criterion of insufficient O_2 for the roots.

The removal of soot, deposited by smoke from industrial sources, on apples grown in the bottomlands along the Ohio River in the northern Panhandle of West Virginia, D. S. Brown and R. H. Sudds. (W. Va. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 234–238*).—In trials of different methods and materials, it was found that a 5 or 10 percent "BW" silicate solution at 80° F. in a Bean Model E underbrush-flood washer, followed by the Bean No. 7 two-way cleaner, was effective in removing soot such as occurs on Willow Twig apples grown in the bottom-land orchards in the Ohio River Valley. The addition of enough soap to cause a slight suds was believed advantageous. In common storage tests the washing treatment caused no significant decrease in the expected storage life of the apples.

A progress report on pear culture studies in Indiana, J. A. McClintock. (Purdue Univ.). (*Hoosier Hort., 21 (1939), No. 11, pp. 164–167, fig. 1*).—Observations on a planting of pear trees comprising horticultural varieties top-worked on Old Home, itself on *Pyrus calleryana* roots, showed satisfactory growth in almost all cases. However, the use of blight-resistant scaffolds did not in itself insure successful pear culture in the case of fire-blight-susceptible varieties. When supplemented with in-bloom sprays, excision, and zinc chloride treatment of cankers, suscepts such as Bartlett may produce satisfactory crops. Old Home itself proved somewhat susceptible to fire blight. An examination of the fruits suggested the likelihood that Old Home is not a pure *P. communis* variety but may contain some sand pear ancestry.

The effects of varying amounts of nitrogen, potassium, and phosphorus on the growth of young peach trees, F. P. Cullinan, D. H. Scott, and J. G. Waugh. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 61–68, figs. 3*).—Selected 1-year-old seedlings budded to Elberta were planted in sand in 3-gal. crocks and, after a preliminary period to develop top growth, were supplied with nutrient solutions differing in their contents of N, P, or K. The most outstanding differences in the one season were in the N series. Below 60 p. p. m., growth was in accord with the amount of N supplied. Trees receiving 60 p. p. m. made nearly twice the top growth of those at 30 p. p. m. Above 60 p. p. m., growth was not significantly larger than at 60 p. p. m. With K, growth increased up to 10 p. p. m.; while with P, no significant differences were obtained above 4 p. p. m. Late in the season the leaves at the tips of the 0, 2, and 5 p. p. m. K trees were noticeably smaller, rolled, and lighter green in color. Marked Fe chlorosis developed in the early stage of growth in the K series but was usually corrected by applications of ferric citrate. In leaf analyses, N content paralleled that of the nutrient solution. K content of the leaves was high in all the N series, and apparently was independent of N content. P content was inversely proportional to N content. The K content of the leaves in the K series was almost directly correlated with that in the nutrient solution, indicating that leaf analysis affords an accurate picture of the K situation in the soil. In the P series, leaves of trees

receiving under 10 p. p. m. of P in the nutrient solution contained less P than those receiving 20 or 40 p. p. m. The K content of all peach leaves showing K deficiency under field conditions was below 1 percent on a dry-weight basis.

Rolling of leaves on Oriental plum trees, apparently caused by cool summers, W. H. Chandler. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 259, 260, fig. 1*).—At Berkeley, Calif., where the mean temperature between April 1 and October 31 is 58° F. or lower, leaves of many varieties of Oriental plums, *Prunus salicina* and *P. simonii* and hybrids between them, were observed to roll inward from their upper surfaces. Since leaves of other *Prunus* species from various sources failed to exhibit the phenomenon and since no insect or disease could be associated therewith, the author suggests that low temperature may reduce the growth of some marginal cells more than that of cells nearer the midrib.

Variation and correlation in bud mutants of the Montmorency cherry, J. W. Crist. (Mich. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *59 (1939), No. 5, pp. 393–395*).—A study of six trees propagated from a single barren branch on a Montmorency tree located near South Haven, Mich., showed two to be wholly unfruitful, one wholly normal, and the others mostly barren but with one or more fruitful limbs. Measurements of leaf areas on spurs of mutationally barren branches were compared with those of normally fruitful branches for degree of variation and concomitancy of variation. There appeared an indication of greater but less heterogeneous variation in the former than in the latter class of leaves.

Observations on mazzard and mahaleb seedlings bench grafted to varieties of sweet and sour cherries, K. D. Brase. (N. Y. State Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 110–112*).—Sweet, as well as sour, cherries were bench-grafted successfully during the dormant season on mazzard seedlings too large for subsequent budding. This fact opens the way to the use of otherwise worthless seedlings and cuts down by 1 yr. the time required to produce a salable tree. Results with mahaleb seedlings indicated that sour cherries thrive better on mahaleb than do sweet varieties, and that various degrees of incompatibility may exist between mahaleb trunks and the scion variety.

Translocation of nitrogenous substances in the Cuthbert raspberry, C. J. Engard. (Wash. State Col.). (*Bot. Gaz., 101 (1939), No. 1, pp. 1–34, figs. 3*).—Data are presented concerning the distribution and translocation of total organic, total soluble organic, alpha amino, diamino, amide, ammonium, and nitrate N in the vegetative canes of the Cuthbert raspberry. There was observed a steady increase in the concentration of total organic N from the basal segment to the top. Total organic N was higher in the leaves than in the stems, but the total soluble N and amino acids were about 50 percent lower in the leaves than in the stems. All N gradients were positive and apparently little more than manifestations of the ratio of the amount of living protoplasm-containing cells to nonliving protoplasm-lacking cells in the various parts of the plant. There was a considerable loss of N from the above-ground portions of the plants from May 15 to June 23, apparently due to its escape as gas or through leaching by rains. Nitrate was the important translocational form of N in the Cuthbert raspberry.

Storage of strawberry plants, M. H. Haller. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 466–472*).—Howard 17 (Premier) strawberry plants obtained from two Maryland nurseries at different times throughout the winter were stored in crates with roots in sphagnum moss. At the height of the planting season in March, some of each lot of plants were set in the field in direct comparison with freshly dug material. Practically all the plants stored

for 3 mo. at 17° F. were dead, but all other lots gave excellent stands. Of the several temperatures employed (17°, 30°, 32°, and 36°), 32° is recommended as most desirable. Plants stored at 32° for as long as 6 mo. grew satisfactorily. The removal of leaves from plants at the time of storing was not beneficial. Fumigation with methyl bromide at the time of storing was harmful, but when used just prior to planting proved uninjurious. In plantings made in late April or early May, under less favorable conditions, the plants from storage made consistently and often markedly better growth than the controls, as indicated by leaf and runner counts and percentage of stand.

Transpiration of lemon cuttings with reference to leaf-root relationship, J. B. Biale. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 250–254, figs. 2*).—Determinations of the variability of the plant material used in studies of the effects of leaf removal on the transpiration of rooted Eureka lemon cuttings showed that differences in water loss greater than 10 percent could be considered due to treatment. There was no significant difference in rate of water loss whether leaves were removed from the basal or distal end of the cutting. That decrease in water loss does not necessarily go hand in hand with reduced leaf area was shown in increased water losses of 75, 35, 12, and 10 percent, paralleling a decrease in foliage area of 29, 32, 33, and 28 percent, respectively. Thus an approximately uniform reduction in leaf surface was responsible for an initial high rise in water loss, followed by progressively smaller increases.

Notes on the storage of Wedgewood iris blooms, T. M. Whiteman and R. C. Wright. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 785–785*).—Freshly cut buds of Wedgewood iris kept in good condition for 4 days when held in containers of water at 70° F. Flowers in full bloom kept 3 days under like conditions. After 1 week's dry storage at 32° and 40°, buds remained in good condition for only 1 day at 70°. Apparently, 32° was more favorable than 40°. Blooms held for 6 weeks at 32° were not in good condition when removed from storage. The authors suggest that Wedgewood iris blooms designed for display at room temperatures should not be held in water at a temperature much higher than 32° for longer than 1 week.

The influence of storage temperatures on the forcing of King Alfred narcissus bulbs, D. V. Lumsden. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 786–790, figs. 3*).—Bulbs grown for 1 yr. under field conditions at Beltsville, Md., were dug June 24 and after being cured in a ventilated bulb house were divided into lots and placed for 2 weeks in controlled temperatures of 70°, 80°, and 90° F. Check lots were held throughout the season in the bulb house. After this preliminary treatment, the bulbs were again divided, and some from each treatment were placed at 50°, 40°, and 32° for 1 mo. At the end of this period, certain lots were given a further month's treatment at 80°, 70°, 60°, and 50°. The unusual treatment of 32° F. during midsummer resulted in a high yield of flowers, and a final storage period at 60° was more effective in accelerating blooming than was either 70° or 80°. There were relatively few nonblooming bulbs in the group exposed at 32°.

Fertilizer for narcissus bulbs in North Carolina (progress report), S. L. Emsweller, G. O. Randall, and J. G. Weaver. (U. S. D. A. and Univ. N. C.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 791–795*).—In two experiments with King Alfred bulbs at Castle Hayne, N. C., involving differential fertilizer in one case and placement and time-of-application trials in the other, no significant differences in yield were recorded in any instance. The number of bulbs rotting in storage were slightly but significantly larger in the case of the larger amounts of fertilizer. There was some evidence that the addition of boron to the fertilizer increased the number of flowers in the year following application.

Growth studies of King Alfred narcissus bulbs, A. H. CURTIS. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 781, 782, fig. 1*).—Records taken at approximately monthly intervals on narcissus bulbs planted October 11 at Beltsville, Md., and fertilized on March 23 with 1,500 lb. per acre of a 5–8–5 NPK mixture showed the growth rate of the entire plant to be rather slow from planting to March 1, when the tops were emerging from the soil. At the time of flowering, the bulbs, exclusive of roots and tops, had dropped almost to their original weight but increased rapidly thereafter. Top growth paralleled increase in total weight but lagged somewhat. Bulb increase paralleled top growth and total weight increase but also lagged.

Petunia variety trials, 1938, E. I. WILDE (*Pennsylvania Sta., Jour. Ser. Paper 875 (1938), pp. [32]*).—A total of 321 stocks were included.

Rhododendrons from cuttings, G. G. NEARING and C. H. CONNORS (*New Jersey Stas. Bul. 666 (1939), pp. 23, figs. 7*).—A method has been developed whereby hybrid varieties of rhododendron may be propagated commercially from cuttings with satisfactory results for the majority of varieties attempted. The method is dependent upon the use of a stratified root medium, a special type of propagating frame, the orientation of these frames with respect to north light, and the reflection of an adequate amount of light into the frames. The rooting medium consists of a bottom layer of mixed granulated peat and spent mushroom soil, a middle layer comprising a mixture of sedge peat and sand, and a top layer of sand. Cuttings are made between July 1 and November 15, preferably from the newest tip growth sufficiently mature to possess dark green leaves. Some root growth may begin during the first autumn, but normally most root development will take place during the subsequent May, June, and July. Most cuttings are well rooted and ready for transplanting in August or early September. Healthy cuttings that are not satisfactorily rooted by this time should be replanted in a newly made propagating bed. The results of rhododendron propagation by this method in 1937–38 show that nine varieties yielded 50 percent or more of rooted cuttings, and eight other varieties produced from 25 to 50 percent.

The method was used successfully with a large number of species of rhododendrons, ericaceous and nonericaceous broadleaved evergreens, and conifers.

The immediate effect of pollen on the fruit of the chestnut, J. W. McKAY and H. L. CRANE. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 293–298*).—Noting that the application of two kinds of pollen to the flowers of a Japanese chestnut resulted in nuts of contrasting size, the authors repeated the experiment with flowers and pollen of the Japanese and Chinese chestnuts. In comparing the nuts produced on a male sterile Japanese chestnut with pollens from parental trees bearing different-sized nuts, there were observed highly significant differences in mean weight of the resulting nuts. Pollen from varieties bearing small nuts tended to produce nuts smaller in size than those of the pistillate tree and vice versa. The immediate effect of the pollen on the weight of the nut is interpreted as an influence of pollen on embryo development, a type of xenia said to be infrequent in horticultural plants.

FORESTRY

[Forestry studies by the Pennsylvania Station], W. C. BRAMBLE and D. D. STEVENSON (*Pennsylvania Sta. Bul. 382 (1939), pp. 45, 46, fig. 1*).—Included are comments on the progress of the following investigations: Silvicultural management of Virginia pine, factors affecting the flow of maple sap, farm wood lot management, spacing of red pine, and silvicultural practices affecting deer foods.

[Forestry studies by the Vermont Station] (*Vermont Sta. Bul. 452 (1939), pp. 22, 23*).—Included are brief progress reports on the tolerance of forest trees,

the importance of the phloem in movement of plant materials, and thinning in forest plantations.

The effect of length of day on the height growth of certain forest tree seedlings, J. R. Jester and P. J. Kramer. (U. S. D. A. et al.). (*Jour. Forestry, 37 (1939), No. 10, pp. 796–803, figs. 7*).—Observations at Duke University on the response of various hardwood and softwood forest seedlings to different light periods ranging from 8.5 to 24 hr. per day indicated that certain species, such as slash pine, shortleaf pine, jack pine, and beech, can be thrown out of their normal growing rhythm by long days, while others, such as chestnut oak and southern red oak, are not readily influenced. Short days significantly retarded the height development of black locust, slash pine, red maple, and chestnut oak but not southern red oak. Long days increased the height of black locust, slash pine, and red maple and decreased that of chestnut oak. Beech, red maple, southern red oak, black locust, and chestnut oak, both in the greenhouse and out-of-doors, held their leaves longer with continuous light or increased day length. Red maple grown indoors with continuous light retained most of its leaves over the entire test period of nearly 2 yr.

[**Fertility needs of black locust**] (*Miss. Farm Res. [Mississippi Sta.], 2 (1939), No. 10, p. 5*).—A study of plantations established in 1935 showed a significant relationship between depth of soil and height growth, indicating that better-than-average upland soils are required for favorable development.

Growth rate and position of wood in tree as factors influencing kraft and sulphite pulps from jack pine, G. H. Chidester, M. W. Bray, and C. E. Curran. (U. S. D. A. and Univ. Wis.). (*Jour. Forestry, 37 (1939), No. 9, pp. 680–683, figs. 2*).—Following separation into top, middle, and butt bolts, pulping data were taken on samples of about 1 cord each of 8-ft. bolts from jack pine trees of several diameter classes. The density, summerwood content, and heartwood content were found to decrease with the increasing height of the tree and, in general, with increasing diameter breast height. The weight of wood per cord decreased slightly with increasing diameter breast height. In general, little relationship existed between chemical properties and the position of the wood in the tree. However, with an increase in diameter breast height, the cellulose, alpha-cellulose, lignin, and pentosans were lower and the extractives higher. The low heartwood content of the tops, together with a higher moisture content, permitted a slightly longer cooking time to give a more complete reduction than was obtained from middle and butt bolts. All types of growth pulped equally satisfactorily by the kraft process. The small top bolts excelled all others in the tensile strength of the sulfate-derived pulps. In sulfite pulping the differences in the strength of the pulps obtained from different diameter classes were only slight; and the most desirable wood, particularly for the shorter cooking periods, consisted of the top portions of the larger trees.

Volume tables for plantation grown white pine, Pinus strobus, L., in Connecticut, H. W. Hicock, A. D. Rhodes, and A. R. Olson (*Connecticut [New Haven] Sta. Bul. 427 (1939), pp. 14, figs. 4*).—Based on measurements of trees toppled by the September 1938 hurricane, three volume tables were constructed, two in cubic feet and one in board feet. The stands represented a wide variety of planting sites and planting conditions, ranging from sites of very low to those of superior productivity. Directions for reading the alignment charts and for application to the volume tables are included.

The use of chemicals in forest fire control, T. R. Truax. (U. S. D. A. and Univ. Wis.). (*Jour. Forestry, 37 (1939), No. 9, pp. 677–679*).—Certain chemicals which had shown promise in controlled laboratory trials were tested in the open under natural conditions where possible. Among materials tested were grass fuels in the South; hardwood leaf litter in the Appalachians; slashings in the

Appalachian, Lake States, and Pacific Northwest regions; and pine duff and brush in California. Chemical solutions and foams showed different results on different fuels. The pronounced glow-retardant materials, of which monoammonium phosphate was selected as representative, were most effective on the glowing types or combinations of glowing and flashy types, such as fresh pine slashings. These materials showed substantially increased effectiveness over water on all fuels except rotten wood. Foams were of most value on logs and branches and rotten wood, where the burning surfaces could be coated with a continuous layer of foam. Considering the whole range of fuels and concentrations employed, the monoammonium phosphate was the most effective of the materials tested. The use of chemicals appeared most important in the early or initial stages of attack.

DISEASES OF PLANTS

The Plant Disease Reporter, [October 1 and 15 and November 1 and 15, 1939] (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr.*, 23 (1939), *Nos. 18, pp. 299–309, figs. 3; 19, pp. 311–325, figs. 5; 20, pp. 327–337, figs. 2; 21, pp. 339–349, figs. 2*).—The following are included:

No. 18.—Phloem necrosis of elm serious in southwestern West Virginia, by J. G. Leach, and in Kentucky, by W. D. Valleau; incidence of ear rots in the 1938 corn crop, by N. E. Stevens; tobacco field survey, including diseases in Wisconsin in 1939, by J. Johnson; effect of wind on blossom-end rot of tomatoes, by J. G. Horsfall and A. D. McDonnell; vegetable pathology notes from South Carolina, including beans, tomatoes, and watermelons, by C. F. Andrus; and brief notes on *Sclerotium delphinii* on trillium and *Cerebella andropogonis* on carpet grass.

No. 19.—Charcoal rot (*Rhizoctonia bataticola-Macrophomina phaseoli* complex) on cowpeas, soybeans, lespedeza, corn, and wild plants in Illinois, by L. R. Tehon and G. H. Boewe; two diseases (*Bacterium sepedonicum* and *Phytophthora erythroseptica*) of potato newly reported from Massachusetts, by O. C. Boyd; species of *Phytophthora* responsible for market decay of western honeydew melons and cantaloups, by J. S. Wiant; and brief notes on downy mildew in cucumbers and nematode infestation of wheat in Georgia.

No. 20.—Some records of first appearance or unusual occurrence, including yellow-red virosis on chokecherry in Illinois, Stewart's wilt disease of corn in California, and first report of *Colletotrichum trifolii* on alfalfa in New Mexico; a survey of cotton boll rot diseases in 1939 and the micro-organisms associated with them, by P. R. Miller and R. Weindling; Persian walnut and filbert diseases in the Pacific Northwest in 1939, by P. W. Miller; and *Diplodia* stalk rot and bacterial wilt again prevalent in Illinois field corn, and bacterial wilt causing more damage to early sweet corn and to some dent corn early in the 1939 season than occurred in 1938, by B. Koehler.

No. 21.—Notes on entomogenous fungi (including fungi on mosquitoes, a fungus parasite—*Fusarium*—of sweetpotato weevils, and *Empusa fresenii* on the Norway maple aphid (*Periphyllus lyropictus*)), by V. K. Charles; conifer diseases hitherto unreported from the Southwest, by D. E. Ellis; distribution of X-disease of peaches in Massachusetts, by O. C. Boyd; some diseases of note in Ohio this year, by C. C. Allison; Summary of Weather and Disease Situations in Massachusetts in 1939, by O. C. Boyd (see page —); and some reports of first appearance of bacterial ring rot of potato in Ohio, smut of dahlias in California, *Botrytis* on gladiolus leaves in Oregon, scab on cultivated violets in Massachusetts, and *Cephalosporium* wilt of persimmon in Texas.

Index to **Supplements 105–110**, N. W. NANCE (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 1938, Sup. 111, pp. 321–342*).

Diseases **of field and orchard crops in Georgia and recommended control measures**, H. I. BORDERS. (Coop. U. S. D. A.). (*Ga. Agr. Col. Cir. 277, rev. (1939), pp. [3]+24*).

[**Phytopathological work by the New York State Station**] (*New York State Sta. Rpt. 1939, pp. 23–28, 37, 38*).—Brief progress reports are given on studies of fruit tree diseases, including apple scab control, cedar-apple rust, and *Coccomyces* cherry leaf spot; diseases of raspberries, gooseberries, currants, blackberries, and strawberries; cabbage yellows resistance; *Fusarium*-induced diseases of tomatoes and peas; diseases of canning crops, including the pea root rot and foot rot complex, mosaic of beans, and red cuprous oxide and other new fungicides; hop diseases; potato scab control and potato seed treatment; cauliflower black rot (coop. Cornell Univ.); lima bean seed treatment; and seed-borne diseases and their control on celery, pea, bean, sweet corn, grasses, cabbage, radish, cereals, and other crop plants.

[**Plant disease work by the Oregon Station**] (Partly coop. U. S. D. A.). (*Oregon Sta. Bul. 359 (1938), pp. 11, 16, 17, 62, 63, 66–68, 70, 71, 75, 77, 78, 79, 89, 91, 92, 96, 97, figs. 8*).—Brief reports are included on boron control of alfalfa "yellow top," canning-beet canker, and celery crack; virus-induced bark necrosis or stony pit of pear; bud blight induced by cold in sour cherry; control of fire blight of pear; gummosis-resistant cherry stocks; Bosc pear stony pit and bark necrosis; storage decays of pears; ecology and control of apple and pear scab; crown degeneration of Cuthbert raspberry; stamen blight of youngberry and related brambles; strawberry crinkle disease; comparative studies of *Phytomonas juglandis* of Persian walnut blight and the related pathogen of filbert blight; downy mildew of peas; pea seed treatment for germination; sterilization of greenhouse soils for tomato production; development of curly top-resistant strains of tomato, bean, pumpkin, and squash; onion mildew; control of *Coryneum* blight of Berckman and related arborvitae; and black mold of roses.

[**Plant disease studies by the Pennsylvania Station**] (*Pennsylvania Sta. Bul. 382 (1939), pp. 34, 35, 36, 37, 38, 41, 42*).—Reports of progress are given on diseases of fine turf grasses, by C. C. Wernham and H. B. Musser; tobacco wildfire control, by W. S. Beach; fire blight-resistant pears, and root rot of apples in relation to stock on which propagated, by E. L. Nixon; spray injury and spray materials for apples and peaches, by H. W. Thurston and H. N. Worthley; diseases of mushrooms, by Beach; and serological studies of tobacco wildfire, by J. J. Reid and D. E. Haley.

[**Plant disease studies by the Vermont Station**] (*Vermont Sta. Bul. 452 (1939), pp. 28, 29*).—Brief notes are given on climatic factors in apple scab infection and soil and other factors in potato scab infection.

Boron studies.—I, The susceptibility of various plants to boron toxicity as influenced by soil type, E. R. PURVIS and W. J. HANNA. (Va. Truck Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 3 (1938), pp. 205–209, figs. 2*).—The results of studies of the effects of various applications of borax on the yields of snap beans grown on 9 soil types indicated that the tolerance of a soil to such treatments is correlated with its exchange capacity and with the amount of available boron present. According to their tolerance to borax applied to Norfolk fine sandy loam, 28 plants are classified into 4 groups. A study of the residual effects of borax applications to field plats indicated it to be readily removed by leaching.

Plant viruses: The influence of recent knowledge on methods for their control, R. J. BEST (*Jour. Austral. Inst. Agr. Sci., 5 (1939), No. 3, pp. 162–168*).—A review.

The chemistry of Phytomonas tumefaciens.—I, The lipids of Phytomonas tumefaciens. The composition of the phosphatide, W. B. GEIGER, JR., and R. J. ANDERSON (*Jour. Biol. Chem.*, *129 (1939), No. 2, pp. 519–529*).—Using two synthetic media for this study, bacteria grown on the one containing glycerol yielded only 2 percent of total lipids, of which ±44 percent was phosphatide, while the sucrose-containing medium gave 6 percent total lipids, of which ±64 percent was phosphatide. The phosphatides consisted of about equal parts of lecithin and cephalin. The fatty acids of the phosphatide from bacteria grown on the glycerol medium consisted of small amounts of solid saturated and unsaturated acids and a large amount of liquid saturated acids of high molecular weight. Those of the bacteria grown on the sucrose medium consisted of small amounts of solid and liquid saturated acids and a large amount of liquid unsaturated acids. The latter, as elaborated on the two synthetic media, differed in properties and composition.

Pathogenicity tests with cultures of Ophiobolus graminis Sacc., R. C. RUSSELL (*Sci. Agr.*, *19 (1939), No. 11, pp. 662–669, figs. 2*).—While the pathogenicity tests of all isolates fluctuated markedly with environal conditions, it appeared that the pathogenicity of each may fluctuate independently so that for a time it may be relatively high and then for another period it may be low. In general the pathogenicity of all isolates tended to decrease with continued culture, but some exhibited high pathogenicity after a long period of relatively low pathogenicity. Though an attempt to alter the pathogenicity of two isolates by maintaining subcultures at widely different temperatures and by repeatedly passing one subculture of each through the host was continued for 5 yr., no consistent effects on pathogenicity were noted.

Can rusts fix nitrogen? B. D'OLIVEIRA (*Nature [London]*, *144 (1939), No. 3645, p. 480*).—Experiments with cereal rusts (*Puccinia* spp.) pointed to an increase in the amount of nitrogen in rust-infected plants. The author believes the results sufficiently suggestive to warrant bringing to the notice of others.

A mutation for pathogenicity in Puccinia graminis tritici, M. NEWTON and T. JOHNSON (*Canad. Jour. Res.*, *17 (1939), No. 9, Sect. C, pp. 297–299*).—A pathogenic change explained as a mutation occurred in a uredial culture of race 52 of *P. graminis tritici* previously constant in this respect for nearly 2 yr. The change appeared to have occurred during 6 months' storage of the urediospores in a refrigerator at ±8° C. When cultured in the greenhouse at the end of this time the rust appeared to be a mixture of race 52 and a hitherto undescribed physiologic race, with the latter predominating. The original culture was left in storage 4 mo. longer, after which it gave rise to a pure culture of the new race which has been assigned No. 178.

The wheat stem and leaf rust epidemics of 1938 in Kansas, L. E. MELCHERS and C. O. JOHNSTON. (Coop. Kans. Expt. Sta.). (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr.*, *1939, Sup. 116, pp. 51–68, figs. 5*).—This summary account outlines the crop conditions leading up to the stem rust epidemic, its northward spread, the meteorological conditions in Kansas as affecting the disease, the losses involved from stem rust as to yield reductions, abandonment, loss of seed, and breaking of straw, relations of varietal resistance, and the leaf rust situation in Kansas in 1938.

The effect of leaf rust on the yield and quality of Thatcher and Renown wheat in 1938, B. PETURSON and M. NEWTON (*Canad. Jour. Res.*, *17 (1939), No. 11, Sect. C, pp. 380–387*).—In tests at Winnipeg (1938) Thatcher and Renown wheats were sown late in 1/400-acre plats, and Thatcher alone was sown early in rod-row plats. Half the plats of each variety were kept as free as possible from leaf rust by frequent applications of sulfur dust, but the other half became heavily

infected. In the 1/40-acre plats leaf rust reduced the yields of the two varieties by 51.17 and 29.61 percent, respectively, and in the rod-row of Thatcher by 37.02 percent. The yield decreases are said to have been due more to reductions in weight than in number of kernels per head. All nondusted plats ripened about 3 days earlier than the dusted, and the grain from them ranked one grade lower than that from the corresponding dusted plats. In both varieties the protein content was diminished and the carotene content increased in the untreated plats.

Controlling seed-borne stinking smut of wheat by disinfectants, R. SPRAGUE. (Coop. U. S. D. A.). (*Oregon Sta. Bul. 363 (1939), pp. 33*).—Though it is said that most farm seed wheat in Oregon may be freed from smuts (*Tilletia tritici* and *T. levis*) by New Improved Ceresan, copper carbonate, basic copper sulfate, and "34 copper fungicide" in both winter and spring wheats, various factors influencing their effectiveness were studied in the field (1934–38). The later wheat is seeded in the fall the greater the chances for optimum smut development. Under these late-fall conditions the 18–20 percent carbonate proved ineffective and even the 52 percent concentration partially so, but New Improved Ceresan was effective at increasing rates (0.75–1 oz.) and basic copper sulfates were fairly effective. With heavy spore loads control of soil-borne smut is said to be difficult. However, it is much less prevalent than before the general use of combine-harvesters, and the copper dusts (3, or better 4 oz. per bushel) or New Improved Ceresan (1 oz. per bushel) applied just before seeding have given some control. The length of storage between treating and seeding had no effect on the degree of control by copper dusts, but New Improved Ceresan (0.5–0.75 oz. per bushel) gave increased stands with seeding a few days after treatment and only slight losses after 6 weeks, but after a year's storage seeding needed to be about 10 percent heavier than normal. Acid soils reduced the amount of smut, thus simplifying control measures. Treatments weakening germination are to be avoided when seeding in heavy soil. Smut balls in the seed wheat increased the difficulty of control, and necessitated use of larger amounts of fungicidal dusts. Wet treatments gave good control if the smut balls were thoroughly soaked but endangered germination. In separate tests of a large number of copper dusts the 50 percent basic copper sulfates and 52 percent copper carbonates gave the best control, with the 26 percent copper dusts almost as effective. Certain arsenicals also gave good control but are not recommended because of the hazard to users. Wheats resistant to seed-borne smut races should be treated to reduce losses from smut and winter injury attributed to latent smut infection. Specific recommendations for local conditions are included.

Diseases of vegetable crops in Georgia and recommended control measures, H. I. BORDERS. (Coop. U. S. D. A.). (*Ga. Agr. Col., pp. [1]+14*).

Diseases of beans in southern Florida, G. R. TOWNSEND (*Florida Sta. Bul. 336 (1939), pp. 60, figs. 13*).—This handbook includes pertinent information on diseases caused by nutritional disorders, bacteria, and fungi, diseases and injuries due to other causes, and control by exclusion, eradication, immunization, and protection. There are 26 literature references.

A mosaic disease of cabbage, R. H. LARSON and J. C. WALKER. (Wis. Expt. Sta. and U. S. D. A.). (*Jour. Agr. Res. [U. S.], 59 (1939), No. 5, pp. 367–392, figs. 15*).—The cabbage mosaic described, apparently differing from crucifer virus diseases observed elsewhere, is reported to be extremely destructive in southeastern Wisconsin. All cultivated and wild cruciferous hosts tested have proved susceptible. Among the noncruciferous hosts are Swiss chard, sugar beet, spinach, larkspur, petunia, and zinnia, and the reactions of several *Nicotiana* species are described because of their importance in differentiating this virus. The peach aphid (*Myzus persicae*), the cabbage aphid (*Brevicoryne*

brassicae), and the cabbageworm (*Pieris rapae*), all common in commercial fields, were shown to be vectors. *B. brassicae* became viruliferous after a half hour's feeding on infected plants and infected healthy test plants in the same length of time. *M. persicae* required 1 hr. to become viruliferous, though the infective feeding time was the same as for the cabbage aphid. Both the alate and apterous forms of these two aphids are vectors. The disease was much more severe at 24°-28° C., and within this range stunting and necrosis occurred. New foliage appeared symptomless in infected plants held at 16° or lower. The virus was transmitted mechanically by the carborundum method, and it remained infectious in vitro for 24-48 hr. at 20°-22°. Its tolerance to dilution was ± 1-1,000, and it was inactivated by 55° for 10 min. or by drying. The virus was recovered from immature but not from mature pods and seeds of cabbage, and seed transmission has not been finally proved. Overwintering cruciferous weeds were demonstrated to be an important source of inoculum in southeastern Wisconsin. Preliminary trials confirmed field observation that certain cabbage varieties are more tolerant to the disease than others. There are 45 literature references.

Effect of nitrogen supply of sweet corn on the wilt bacterium, G. L. McNew and E. L. Spencer (*Phytopathology, 29 (1939), No. 12, pp. 1051-1067, figs. 4*).—Sweet corn seedlings in sand cultures supplied with nitrogen were more severely wilted by *Phytomonas stewartii* than were control plants without it. The added nitrogen appeared in the tracheal tubes within 8 hr., and most of it was assimilated within 31 hr. The bacteria grew in tracheal sap containing 20-40 p. p. m. of nitrogen, but did better at 200 p. p. m. The latter concentration was obtained in plants receiving an optimum supply for their growth, but the plants used most of the nitrogen so that the bacteria were not continuously supplied. Under such conditions the bacteria were less destructive than in plants receiving a nitrogen supply in excess of their needs. In nitrogen-fed plants, virulent bacterial strains usually replaced the attenuated ones, but in nitrogen-deficient plants the virulent strains were handicapped by nitrogen starvation and sometimes were replaced by weakly virulent strains. It is concluded that the nitrogen supplied to sweet corn increases the severity of wilting by providing a better medium for growth of the parasite in the tracheal tubes, and that the changes in virulence are controlled by this effect on the growth of the virulent strains.

A motile bacterium isolated from nitrogen-deficient seedlings proved capable of producing some of the symptoms typical of the *P. stewartii* wilt in sweet corn.

Pathological research shows increased yields of cotton because of treatment with Ceresan (*Miss. Farm Res. [Mississippi Sta.], 2 (1939), No. 10, p. 7*).—Material increase in germination and yield and decrease in stem lesions by use of 2 percent Ceresan, and increase in germination and decrease in stem lesions by mechanical delinting of cottonseed are reported. The benefits of the dust treatment were evident even after 17 months' subsequent storage before planting.

Three species of Pythium with large oogonial protuberances, C. Drechsler. (U. S. D. A.). (*Phytopathology, 29 (1939), No. 12, pp. 1005-1031, figs. 10*).—The author supplements previously published diagnoses of *P. mastophorum* and *P. polymastum* by an illustrated discussion of their morphology and development, on the basis of which they are considered to be intimately related. In the same intimate relationship is rather obviously embraced also the extraordinarily large oomycete which, under the name *P. megalacanthum*, has been made known by several Dutch investigators as causing flax scorch in the Netherlands.

While agreeing with A. de Bary's original description of *P. megalacanthum* in some particulars, the sexual apparatus of the flax-root fungus disagrees with it in other and no less important particulars. None of the later literature in which De Bary's binomial is mentioned in connection with a plant disease can be held to contain very convincing evidence that the fungus to which this name was originally attached has actually been rediscovered in recent times. The true *P. megalacanthum* may even prove to be alien to the *mastophorum* series herein treated, perhaps having closer affiliations with such spiny proliferous forms as *P. anandrum* and *Phytophthora stellata*.

Appearance of a new potato disease in northeastern Colorado, L. B. Daniels. (Colo. Expt. Sta.). (*Science, 90 (1939), No. 2334, p. 273*).—The disease, said to be due apparently to the pentatomid plant bug *Chorochroa sayi*, may cause a complete wilting of the leaves or tips of the plants or may be more general in its symptoms. It is very similar to psyllid yellows.

Verticillium wilt of potatoes in Prince Edward Island, G. W. Ayers and R. R. Hurst (*Sci. Agr., 19 (1939), No. 12, pp. 722–735, figs. 9*).—A survey of wilt prevalence revealed it to be an important problem of recent years, and its successful control, dependent on the seed potato inspection service, is rendered almost impossible because of the difficulty of estimating its presence and severity in the field. Both the time of inspection and of the appearance and development of wilt are variable, and environal conditions may modify or aggravate the symptoms and such diseases as early and late blight may mask them. Numerous isolations and pathogenicity trials have shown this disorder to be due to *Verticillium albo-atrum*, which was found to make good growth on media over a wide temperature range with maximum growth at 19°–21° C. Major epidemics in the field have their origin in diseased stocks of the preceding year, and tuber index trials have indicated that wilted plants develop from both eye and stem-end sets of infected tubers. The chief economic effect of wilt appears in reduced yields of marketable tubers. The control measure at present advocated is the use of disease-free seed and disposal of wilted plants along with those immediately adjacent. Long rotations are also advised.

Protein changes in mosaic-diseased tobacco, L. F. Martin, A. K. Balls, and H. H. McKinney. (U. S. D. A.). (*Jour. Biol. Chem., 130 (1939), No. 2, pp. 687–701, figs. 4*).—Using procedures (described) enabling estimation in samples of whole tissue of the nucleoproteins of tobacco common mosaic (and certain other mosaics) as distinguished from the normal digestible proteins, it was found that after inoculation of young plants with common mosaic the virus protein accumulated at first by displacement of an equal amount of normal proteins. After 3 or 6 days in lower and upper leaves, respectively, a very rapid increase in virus protein concentration began, accompanied by an increase in total nitrogen and total protein and by appearance of visible symptoms. Finally the virus was almost entirely present in addition to the amount of normal protein maintained by healthy plants. As individual leaves or whole plants grew older the virus protein gradually decreased with advancing maturity of tissues. Very resistant tobacco showed the same effects, but quantitatively a lower maximum concentration of virus protein was attained and the protein disappeared earlier. Extremely resistant tobacco responded by decreased total nitrogen concentration and also by decrease in some insoluble and undigestible nitrogen constituent, without forming measurable amounts of virus protein. These results may be explained either by a direct conversion of normal proteins into virus protein, or by a competition of normal and virus protein synthesis for available nitrogen, accompanied by an acceleration of the total nitrogen assimilation and protein synthesis.

The isolation and properties of tobacco ring spot virus, W. M. STANLEY (*Jour. Biol. Chem., 129 (1939), No. 2, pp. 405–428, figs. 2*).—A high molecular weight nucleoprotein with the characteristics of this virus was isolated by differential centrifugation from affected tobacco plants, and its properties are described in detail. Its solutions containing 0.01 M phosphate buffer caused many more lesions on inoculation than did solutions containing more concentrated or more dilute phosphate buffer or other electrolytes. The optimum conditions for storing and testing the virus were quite different from those for tobacco mosaic virus, showing the importance of careful study of these conditions for each virus under investigation. The molecular weight and diameter based on some of the constants determined and on ultrafiltration data are 3,400,000 and 19 mμ, respectively. It is said to be the smallest virus thus far isolated and to be essentially spherical in shape. It is very unstable as compared with tobacco mosaic virus and has not been obtained in crystalline form, although no alterations in the properties resulting from purification have been noted. The virus contains about 40 percent of nucleic acid, which gives negative tests for desoxy sugar and a positive test for pentose. The nucleic acid content is about eight times that of tobacco mosaic virus and approaches that of the sperm nucleoproteins. The virus gives a specific precipitin reaction with its antiserum.

Isolation of virus from plants recovered from the tobacco ring spot disease, W. M. STANLEY (*Jour. Biol. Chem. 129 (1939), No. 2, pp. 429–436, fig. 1*).—Apparently normal Turkish tobacco leaves recovered from tobacco ring spot virus infection were found to contain about 1 part of virus in 500,000 of fresh green leaf material, whereas leaves bearing many necrotic lesions and from the same plants contained 1 part in 80,000 of the fresh material. No difference in the activity, sedimentation constant, isoelectric point, or general properties of virus from the two sources was found, hence the virus in recovered plants appears to be the same as that in systemically diseased leaves bearing necrotic lesions. Recovery is said to result from an adjustment by the host and appears to consist of some mechanism through which the virus concentration is lowered to about one-sixth of its former level, with the disappearance of readily visible disease symptoms. Immunity apparently results from the continued persistence of a low concentration of unaltered virus in plants recovered from this disease.

Rust of stone fruits, H. EARL THOMAS, R. A. GILMER, and C. E. SCOTT. (Univ. Calif.). (*Calif. Dept. Agr. Bul., 28 (1939), No. 5, pp. 322–327*).—It is concluded that the evidence to date indicates only one of the two morphological forms, viz, *Tranzschelia pruni-spinosae* f. *discolor*, to be present in California orchards. Inoculations with urediospores from peach and prune on contrasted half leaves of both hosts indicated the presence in the central part of the State of at least two physiological races of the fungus. The evidence indicated three modes of overwintering, viz, twig cankers on peach, urediospores on the bark or other sheltered places, and infected leaves remaining alive and attached to the tree through the winter. Infection on cultivated anemone may be severe but is said to be seldom found in California and to be of apparently little importance in fruit tree infection.

Control of leaf spot and scorch of strawberries, L. SHAW (*N. C. Agr. Col. Ext. Cir. 236 (1939), pp. 8, figs. 3*).—The symptoms and amount of injury are briefly described and control measures outlined.

A résumé of research on [citrus] gummosis in Florida, A. S. RHOADS. (Fla. Expt. Sta.). (*Citrus Indus., 20 (1939), No. 10, pp. 5, 9, 12, 15*).

Experimental injection of hard maple saplings artificially infected with Verticillium albo-atrum R. & B., L. R. TEHON and H. L. JACOBS (*Davey Inst. Tree Surg. [Kent, Ohio] Bul. 7 (1939), pp. 31, figs. 13*).—Trunks of saplings of

hard maple (*Acer saccharum*) were artificially inoculated with the wilt fungus (*V. albo-atrum*). Different materials were then injected into them as follows: Heat-sterilized, phenol-preserved extract from a mixture of about 6-month-old cultures of 12 isolates of the fungus, phenyl-mercuric nitrate (1-2,000), malachite green (1-1,000), brilliant green (1-1,000), and thymol (1-1,200). Boric acid crystals were also introduced dry. Except for the trees injected with malachite green, all of which died, the fungus was isolated after 32 mo. from all inoculated trees, but its advance had been slow and there was no outwardly evident difference between inoculated and uninoculated trees. There was no consistent evidence that either these treatments or the addition of peat moss and 10-3-3 fertilizer to the soil had any effect upon the development of the disease. The chemicals used in the trunks caused definite injury to the trees except in the case of thymol.

Canker development by Cronartium ribicola on young Pinus strobus, R. R. Hirt. (U. S. D. A. et al.). (*Phytopathology, 29 (1939), No. 12, pp. 1067-1076, figs. 2*).—From studies conducted in the Adirondack region and in central New York State it appeared that to some extent the time necessary for the fungus to become evident in the bark depends on the distance of the needle spot from the bark tissue. Needles of *P. strobus* are normally retained by transplants and young plantation stock for 26-28 mo., and a few needles for 36-38 mo., thus providing time for the parasite to reach the bark from some of the needle spots at distances somewhat over 4.5 cm. in both current-season and year-old needles. About half of all the cankers developed were visible by fall of the season following inoculation, and by the second spring afterwards 94 percent were visible. The first appearance in the bark of the larger percentage of cankers from current-season needles was somewhat more tardy than from the year-old needles. The explanation may possibly be concerned with the maturity of the needles and the slight differences in tissue structure of the bark at the end of 1 v. 2 yr. The rate of extension of the rust down the branches towards the stem increased with age of canker through the third year, and on 36 trees observed the average time for branch cankers to reach to the stem was 3 yr. It is thus possible in young plantations to detect cankers in time to remove the infected branches on many of the trees before the stem becomes invaded. After stem invasion from branch cankers the trees usually died within an average of 3.5 yr. Aeciospore production occurred in a few branch cankers, but it was commonly delayed until establishment in the stems for a year or more.

Scirrhia acicola (Dearn.), n. comb., the perfect stage of the fungus causing the brown-spot needle blight of pines, P. V. Siggers. (U. S. D. A.). (*Phytopathology, 29 (1939), No. 12, pp. 1076, 1077*).—*Oligostroma acicola* is transferred to *S. acicola* n. comb. and an emended description presented for this fungus, which is one of the obstacles to natural and artificial reproduction of longleaf pine (*Pinus palustris*) and which has also been reported on *P. taeda* and *P. thunbergi*.

Relative importance and seasonal prevalence of wood-staining fungi in the Southern States, A. F. Verrall. (U. S. D. A.). (*Phytopathology, 29 (1939), No. 12, pp. 1031-1051, figs. 3*).—Based on staining ability and on the frequency of occurrence in periodic isolations from logs and lumber in Louisiana, Mississippi, and Georgia, the important fungi found on pines proved to be *Ceratostomella pilifera*, *C. ips*, *Diplodia natalensis*, and *Diplodia* sp. (undetermined), and on hardwoods, *Endoconidiophora coerulescens*, *D. natalensis*, *C. pluriannulata*, and *Graphium rigidum*. There were few differences or none in the floras found in different pine or hardwood species or in the different localities. *D. natalensis* was abundant only during the hot summer months, *E.*

coerulescens was frequently of low incidence during hot weather, and *C. pilifera* was somewhat lower in frequency during hot weather, while the other species showed but little seasonal fluctuation. There was a general correlation between seasonal frequency and the temperature relations for their growth. The distribution of *C. ips* is believed to be determined largely by the frequency of bark beetles of the genus *Ips*.

The genus Stereum in Pennsylvania, L. O. Overholts. (Pa. Expt. Sta.). (*Bul. Torrey Bot. Club, 66 (1939), No. 8, pp. 515–537, figs. 32*).—A key and descriptions for 27 species of this group of wood-inhabiting fungi are included.

Methyl bromide and root knot nematodes (*New Jersey Stas. Nursery Disease Notes, 12 (1939), No. 2, pp. 5–8*).—Preliminary tests are reported to indicate that this chemical will not destroy nematodes (*Heterodera marioni*) in the root galls, and for the present it is suggested that reliance be placed on preventive rather than curative practices.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Fauna of the national parks of the United States: Birds and mammals of Mount McKinley National Park, Alaska, J. S. Dixon (*U. S. Dept. Int., Natl. Park Serv., Fauna Ser. No. 3 (1938), pp. XII+236, pl. 1, figs. 85*).—A further contribution in this series (E. S. R., 69, p. 681; 74, p. 62) which includes a check list and descriptions both of the birds and mammals of Mount McKinley National Park.

North American big game (*New York and London: Charles Scribner's Sons, 1939, pp. XXII+533, [pls. 30], figs. [53]*).—This account, prepared by a committee consisting of A. Ely, chairman, H. E. Anthony, and R. R. M. Carpenter, includes contributions by many authors on the big game of North America.

Noteworthy additions to the collection of mammals from Iowa in 1938, T. G. Scott. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci., 13 (1939), No. 3, pp. 239–241*).—Three species and subspecies are recorded for the first time as occurring in Iowa, supported by specimens.

Regulations relating to migratory birds and certain game mammals, 1939 (*U. S. Dept. Int., Bur. Biol. Survey, Wildlife Cir. 1 (1939), pp. 13*).

Management of the ringneck pheasant in early winter, P. E. Randall. (U. S. D. A., Pa. Expt. Sta., et al.). (*Pa. Game News, 10 (1939), No. 4, pp. 8, 9, 30, figs. 6*).—Some of the results of an investigation in Lehigh County, Pa., extending from the end of the 1938 small-game season on November 26 until early February 1939, are presented. Data on the winter cover and pheasant roosting sites during the severe winter weather of January 13 are given in tables.

Food of the starling in central New York State, A. A. Lindsey (*Wilson Bul., 51 (1939), No. 3, pp. 176–182, fig. 1*).—Observations based upon the examination of 1,268 stomachs (including 149 nestling stomachs), taken in May and June of several years, are reported, the details being given in two tables. Insects were found to constitute about 35 percent of the material in adult stomachs and 77 percent in nestling stomachs. Vegetable matter made up 41.4 percent in adults and 4.9 percent in nestlings, while mineral items were 0.8 and 2.2 percent, respectively. The remainder of the food in each case was animal matter other than insects, especially millipedes, unidentified animal matter, and animal garbage. It is concluded that the economic status of the starling as evidenced by analyses of stomach contents is not different fundamentally from that reported by Kalmbach and Gabrielson (E. S. R., 44, p. 547; 60, p. 555) for six eastern States before this bird had attained its present num-

bers and distribution. It is pointed out that the food habits on the whole are decidedly beneficial, especially in the case of the nestlings.

[**Work with fur-bearing and game animals by the Oregon Station**] (*Oregon Sta. Bul. 359 (1938), pp. 99–104, figs. 10*).—The work of the biennium 1937–38 briefly reported upon (E. S. R., 78, p. 813) includes elevated v. ground pens for foxes, fox and mink nutritional investigations, small-game management in the Willamette Valley, thermographic records of nesting pheasants, a study of Oregon's big game sex and increase ratios, life history and management of Oregon antelope, and the post-mortem examination of wildlife for parasitic infestation.

[**Work in economic zoology and entomology by the Pennsylvania Station**] (*Pennsylvania Sta. Bul. 382 (1939), pp. 5, 62, 63, 64–67, figs. 2*).—The work of the year reported upon (E. S. R., 81, p. 68) relates to a census technic for the white-tailed deer and the feeding habits of the ring-necked pheasant and bob-white, both by L. J. Bennett; flea beetles on tobacco and potatoes, by H. C. Hallock; hairy chinch bug in fine turf and codling moth control, both by H. N. Worthley; the greenhouse symphilid or garden centipede, mushroom insects, and wireworms, all by C. A. Thomas; pistol casebearer and oil sprays for the European red mite, both by H. M. Steiner; rose-leaf beetle, by M. Wood; spray residue, by Worthley and D. E. H. Frear; and better trout fishing, by G. Trembley and D. C. Sprague.

[**Notes on economic insects and their control**] (*Jour. Econ. Ent., 32 (1939), No. 5, pp. 725–730*).—The contributions presented (E. S. R., 82, p. 72) are: Observations on *Collabismodes cubae* Boh. as a Tomato Pest, by G. W. Barber (pp. 725, 726), Observations on the Flight of Adults of the Sugar-Beet Wireworm (*Limonius californicus* (Mann.)), by F. H. Shirck (p. 726), and Aphid Transmission of the Virus Causing White Streak of Narcissus, by F. S. Blanton (pp. 726, 727) (all U. S. D. A.); Notes on the Sugar-Beet Root Aphid in California, by W. H. Lange, Jr. (pp. 727, 728) (Univ. Calif.); A Recent Pecan Pest, *Cacoecia infumatana* (Zell.), by L. O. Ellisor (p. 728) (La. Expt. Sta.); *Microterys titiani* Gir., an egg predator of *Lecanium corni* Bouché, by P. DeBach (pp. 728, 729) (Calif. Citrus Sta.); and Tandem Doses of Calcium Cyanide for Controlling Insects on Plants, by W. E. McCauley (pp. 729, 730).

[**Contributions on economic entomology**] (*Ztschr. Angew. Ent., 25 (1938), Nos. 1, pp. 1–160, figs. 79; 2, pp. 169–353, pl. 1, figs. 56; 3, pp. 363–524, pl. 1, figs. 58; 25 (1939), No. 4, pp. 545–708, figs. 69*).—Contributions presented (E. S. R., 82, p. 217) are:

No. 1.—Field Studies of the Occurrence, Bionomics, Ecology, and Epidemiology of the Silver Fir Aphid *Dreyfusia* (*Chermes*) *nüsslini* C. B., by C. Hofmann (pp. 1–56); Variation in Abundance of *Polychrosis botrana* in the Vineyard, by F. Stellwaag (pp. 57–80); Investigations of *Hylotrupes bajulus* L.—II, The Predaceous Clerid Beetle *Opilo domesticus* L., an Effective Enemy of *H. bajulus*, by P. Steiner (pp. 81–91) (E. S. R., 78, p. 218); Data on the Biology, Importance, and Control of the San Jose Scale, by O. Watzl (pp. 92–100); The Life History of *Evetria turionana mughiana* and Observations on Other Microlepidoptera Attacking *Pinus cembra*, by M. Seitner (pp. 101–110); M. Seitner's Biocoenotic Study of the Insect Enemies of *Pinus cembra*, by E. Schimitschek (pp. 111–124); Their Capacity to Differentiate Atmospheric Humidities and the Influence of Various Humidities on the Longevity of Three Races (*atroparvus, messeae, typicus*) of *Anopheles maculipennis* in Germany, by A. Hundertmark (pp. 125–141); Pseudoscorpions in the Beehive: A Compilation and Report of Original Investigations, by Z. Örösi-Pál (pp. 142–150); and Influence of Room

on the Fecundity of *Dixippus (Carausius) morosus*, by H. A. Kirchner (pp. 151-160).

No. 2.—A Bionomic and Ecological Forestry Investigation of Nematid Sawflies of Larch, by K. Thielmann (pp. 169-214); Contribution to a Monograph of *Tortrix pronubana* Hübner, Including an Experimental Investigation of Its Biology as Related to Its Importance as a Plant Pest, by E. von Winning (pp. 215-276); The Importance of Some Pentatomids as Enemies of the Nun Moth, by H. Gäbler (pp. 277-290); Contributions to the Forest Entomology of Turkey, I, by E. Schimitschek (pp. 291-310); A Reply to the Contribution of I. Trägårdh and V. Butovitsch on Some Observations on the Quantitative Investigation Methods of Calculating Bark Beetle Infestations, by K. E. Schedl (pp. 311-329) (E. S. R., 82, p. 218); A Reply [to the Above], by I. Trägårdh and V. Butovitsch (pp. 330-336); and Contribution to a Monograph of the Stomoxydinae—the Taxonomic Results of Studies of Some Collections, Especially of Bezzi and Enderlein, by F. Zumpt (pp. 337-353).

No. 3.—The Phytophagous Species of *Megastigmus* (Chalcididae) as Destroyers of the Seeds of Conifers, by K. Escherich (pp. 363-380); Experiments With a New Contact Insecticide (Dinitro-*o*-kresol) for Control of Forest Pests, by C. Hofmann (pp. 381-396); The Practice and Results of Collection of the Pupae of the Red Forest Ant *Formica rufa* L. and Suggestions for the Protection of This Beneficial Predator, by K. Gösswald (pp. 397-418); Investigations of the Effect of the Application of Insecticides on Bees—III, The Action of Pyrethrum on Bees, by F. K. Böttcher (pp. 419-441); Anatomy of the Larval Stages of the Bruchid Beetle *Bruchus quadrimaculatus* Fabr. and the Method of Emergence of the Larva From the Egg-Shell, by D. Mukerji (pp. 442-460) (in English); The Genetic, Animal Psychologic, and Ecologic Side of Mimicry, by F. Steiniger (pp. 461-471); Some Pteromalid Parasites of *Diprion* Sawflies, by S. Nowicki (pp. 472-477); The Influence of Solitary Confinement and of Uncrowded Association on the Development and Growth of the Larvae of *Pieris brassicae* L., by K. Wardziński (pp. 478-486); and A Review of the Literature on Mallophaga, by S. Kéler (pp. 487-524).

No. 4.—The Development of the Nun Moth *Lymantria monacha* as Influenced by Food Quality, by H. Sattler (pp. 543-587); Contributions to the Life History and Control of the Mediterranean Flour Moth, by G. Kunike (pp. 588-608); Injuries to Deciduous and Coniferous Trees by Novosil and Similar Dust Insecticides and Their Action on the Larvae of the Nun Moth and *Nematus* Sawflies, by H. Gäbler (pp. 609-627); Attrahent Experiments With the Nun Moth *Lymantria monacha*, by K. Hanno (pp. 628-641); The Tettigoniid Orthopteron *Barbitistes constrictus* Brunn. as a Forest Pest, by H. W. Nolte (pp. 642-646); The Symbiosis of Wood Wasps (Siricinae) With Fungi, by H. Francke-Grosmann (pp. 647-680); Investigations of the Effect of the Application of Insecticides on Bees—IV, The Action of Derris on Bees, by F. K. Böttcher (pp. 681-702) (see above); and *Eulecanium bulgariense* n. sp., a Coccid Pest of Bulgarian Oil Rose Culture, by H. Wünn (pp. 703-708).

[Contributions on economic zoology and entomology] (*Calif. Dept. Agr. Bul., 28 (1939), Nos. 3, pp. 214-242, figs. 17; 4, pp. 266-283, 288-290, figs. 2; 5, pp. 298-321, 328-345, figs. 63; 6, pp. 378-415, 416-426, figs. 19*).—Contributions on economic insects and other animal pests and their control presented included Caterpillars Attacking Tomatoes in the Northern Tomato-Producing Section of California, by A. E. Michelbacher and E. O. Essig (pp. 214-222) (Univ. Calif.); Eriophyid Studies, IV (pp. 223-239) (E. S. R., 81, p. 824), V (pp. 328-345), and VI (pp. 416-426), in which 14 species, 12 species (and 1 genus is erected), and 10 species, respectively, are described as new, all by H. H. Keifer; Observations

on the Ilicis Mite *Paratetranychus ilicis* McGregor, by R. H. Smith (pp. 240–242), and The Fig Mite *Eriophyes ficus* Cotte and Other Mites of the Fig Tree (*Ficus carica* Linn.), by E. W. Baker (pp. 266–275) (both Univ. Calif.); The Relative Solubility of the Lead Arsenates and Calcium Arsenates, by R. P. Tucker (pp. 276–285); A Hitherto Unreported Noctuid Stem Borer of Corn and Globe Artichoke in California (Lepidoptera: Noctuidae; *Emboloecia sauzalitae* Grt.), by W. H. Lange, Jr. (pp. 288–290) (Univ. Calif.); Exotic Mollusca in California, by G. D. Hanna (pp. 298–321); Supplementary Control of Codling Moth (pp. 378–386) and Observations on *Hypera brunneipennis* and Its Destruction in Baled Hay by Fumigation (pp. 387–392), both by D. B. Mackie and W. B. Carter; The Grasshopper Outbreak in 1939, by S. Lockwood (pp. 393–411); and European Red Mite in Southern California, by R. H. Smith (pp. 412–415) (Univ. Calif.).

[**Work in entomology by the New York State Station**]. (Partly coop. U. S. D. A.). (*New York State Sta. Rpt. 1939, pp. 20–23*).—The work of the year reported upon (E. S. R., 81, p. 239) includes early spring treatments and foliage applications for the control of insects attacking the apple, peach, pear, cherry, grape, raspberry, strawberry, and currant (European red mite, rosy aphid, red bug, pear psylla, oystershell scale, scurfy scale, San Jose scale, bud moth, and fruit tree leaf roller); the biological control of the oriental fruit moth on peaches, and other insects, particularly the codling moth; a study of the relation of insect pests to their environment; ecological studies with the oystershell scale, red bug, bud moth, Japanese beetle, and other insects; experiments with insecticides for the control of insects attacking vegetables (European corn borer, pea aphid, pea weevil, cabbage caterpillar, cabbage looper, bean pests, and striped cucumber beetle) and several attacking ornamentals and nursery plants; and the use of light and bait traps and chemically treated bands for the control of the codling moth and other insects attacking fruit trees.

[**Work with economic insects by the Oregon Station**]. (Partly coop. U. S. D. A.). (*Oregon Sta. Bul. 359 (1938), pp. 8, 9, 11, 17, 43, 44, 47, 48, 53, 54, 63–66, 68, 69, 70, 75–77, 79, 87, 88, 89, 92, 93, 94, 97, 98, 115, 116, figs. 12*).—The work of the biennium 1937–38 (E. S. R., 78, p. 815) at the station and substations briefly reported upon includes control of the pea weevil and its results; investigation and control of the pear thrips; control of the filbert moth *Melissopus latiferreanus* Wlshm.; the red spider on hops; life history observations and experimental control work with the strawberry fruitworm; the western potato flea beetle; the role of pear thrips in causing prune russet; investigation of sprays, spray mixtures, and spray residue; codling moth studies and the use of substitutes for lead arsenate in its control; spider mite; experiments to lessen injury from dormant and summer oil sprays; woolly aphids and perennial canker control on apple trees; the strawberry crown moth *Synanthedon bibionipennis* Hy. Edw.; strawberry aphid; spittle bug (*Philaenus spumarius* L.) on strawberry; pea aphid; onion maggot; western spotted cucumber beetle; garden centipede; insects affecting nursery stock in 1937; and honey and pollen flora investigations.

An instrument for the reproduction, regulation, and control of variable temperature, W. E. Stone (U. S. D. A.). (*Jour. Wash. Acad. Sci., 29 (1939), No. 10, pp. 410–415, figs. 2*).—A description is given of an instrument that has been developed to make possible laboratory reproduction of field-recorded temperatures in experiments at México, D. F., Mexico, in order to determine the possible range of distribution of the Mexican fruitfly and related species in the United States. "The method of preparation of the chart patterns, showing the different steps in the operation and the time consumed, and the methods of making adjustments and of operation are discussed. A mercury-toluene thermostat made of

50 in. of $\frac{5}{16}$-in. bore tubing with a neck of $\frac{3}{16}$-in. bore tubing has been used with the instrument intermittently for 3 yr. without apparent change in volume. Standard well-insulated temperature cabinets cannot be used with the instrument when producing or reproducing highly variable temperatures unless they are equipped with cooling coils, because cooling is too slow. The accuracy obtained in operation is shown in a photograph of charts of reproductions of daily and weekly temperature records and of the production of a gradually increasing and decreasing temperature as well as a constant temperature."

The role of calcium hydroxide in preventing hydrogen sulfide from decomposing lead arsenate, J. M. GINSBURG and L. E. PERLGUT. (N. J. Expt. Stas.). (*Jour. Econ. Ent., 32 (1939), No. 5, pp. 612–615*).—Report is made of a study of the decomposition of acid lead arsenate by hydrogen sulfide in spray mixtures and means of preventing this reaction. "Lead arsenate was mixed with water containing various concentrations of hydrogen sulfide, with and without different quantities of calcium hydroxide. The filtrates of these mixtures were analyzed for soluble arsenic. Chemical analyses were also made of the sulfur compounds formed from the reaction of H_2S and $Ca(OH)_2$. The results suggest the following conclusions: Small quantities of hydrogen sulfide decompose acid lead arsenate, forming large amounts of soluble arsenic. Calcium hydroxide readily reacts with hydrogen sulfide, changing it to calcium sulfide. An excess of calcium hydroxide is required to prevent the decomposition of lead arsenate by hydrogen sulfide."

Effects of heat treatments of some calcium arsenates on their toxicity to silkworms and bean plants, J. W. BULGER and O. A. NELSON. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 5, pp. 615–619, fig. 1*).

Stock sprays: Some comments and conclusions, E. M. SEARLS and F. M. SNYDER. (Univ. Wis.). (*Soap, 15 (1939), No. 8, pp. 99, 101, 111, 113*).

Truck crop sprayers and dusters, W. P. FLINT. (Ill. Expt. Sta. et al.). (*Ill. State Veg. Growers' Assoc. Ann. Rpt., 8 (1938), pp. 40, 41*).

Ease of residue removal from late and early spray applications of lead arsenate to apples, J. E. FAHEY, H. W. RUSK, L. F. STEINER, and R. F. SAZAMA. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 5, pp. 714–717*).

A new method of impregnating green fence posts.—A preliminary report, W. C. NETTLES (*Jour. Econ. Ent., 32 (1939), No. 5, pp. 703, 704*).—An account is given of a new method of treating nondurable green pine posts with water-soluble preservatives to make them resist attacks of insects and decays that was developed at Clemson College during January 1938. This so-called trough method is neither complicated nor expensive, and its use is expected to supplement materially the present serious shortage of fence post timber.

Some quantitative aspects of insect injuries to potato plants, G. F. MACLEOD. (Cornell Univ.). (*Amer. Potato Jour., 16 (1939), No. 7, pp. 179–184*).—Report is made upon extensive tests conducted in New York over a 5-yr. period to determine possible modifications in potato spraying or dusting practices which would result in larger yields of high quality. The experiments have demonstrated a need for more detailed, basic, quantitative measurements of the complex relationships between plant, organism, and spray material. "Under normal field conditions in New York the insect populations of potato plants consist of several species. Differences in tuber yields have suggested the possibility that some species, although present on plants in much smaller numbers than others, may be more injurious. Certainly variations in comparatively small numbers of leafhoppers and tarnished plant bugs on potato plants were more closely associated with variations in tuber yields than was the case with larger numbers of flea beetles and potato aphids. Quantitative studies of various

insect injuries to potato plants employing measurements of plant physiological processes should yield some interesting information."

A review of the potato insect problems in New York State, G. F. MacLeod. (Cornell Univ.). (*Amer. Potato Jour., 16 (1939), No. 9, pp. 232–236*).—A brief review of the status of potato spraying and dusting experiments with insect and other injuries to the potato in New York State.

Important insect enemies of sycamore trees, H. E. Burke. (U. S. D. A.). (*West. Shade Tree Conf., Sacramento, 1938, Proc. Ann. Mtg., pp. 9–18*).—The author has found in the West that there are at least eight species of insects and two red spiders that cause serious injury to the ornamental value and the health of both the native and the introduced sycamores.

Control of red spiders and rust mites, J. R. Watson. (Fla. Expt. Sta.). (*Citrus Indus., 20 (1939), No. 9, p. 8*).

Domestic pests: What they are and how to remove them, L. Hunter (*London: John Bale, Sons & Curnow, 1938, pp. XII+235, figs. 116*).—This practical work, presented in two parts, includes a brief description of each important domestic pest, with a simple remedy for its control, and lists of references.

Responses of the silverfish (Lepisma saccharina L.) to its physical environment, H. L. Sweetman. (Mass. State Col.). (*Jour. Econ. Ent., 32 (1939), No. 5, pp. 698–700*).—The author has found that the silverfish, a common household pest, develops and reproduces best at temperatures of from 22° to 27° C. and relative humidities of from 75 to 97 percent. "It is a long-lived insect, frequently attaining an age of well over 3 yr., yet it may begin reproduction when only 3 to 4 mo. old. In favorable environments an average of about 100 eggs may be laid. The incubation period varies from 3 to 7 weeks at temperatures of 22° to 32°. The newly hatched nymphs are naked, but become clothed with scales at the third molt. The silverfish molts throughout life and continues to grow throughout most if not all of its life. The first instar lasts only 2 to 4 days, but after the second or third instar molting occurs every 2 or 3 weeks for the remainder of life."

Some effects of acid arsenate of lead used against the termite Reticulitermes flavipes (Kollar), T. J. Headlee and D. M. Jobbins. (N. J. Expt. Stas.). (*Jour. Econ. Ent., 32 (1939), No. 5, pp. 638–640, figs. 2*).—Tests conducted have shown that the termite *R. flavipes* is prevented from working timbers surrounded by soil treated with acid arsenate of lead. The cost of such treatment on soil beneath the structure to be erected is comparatively small. "The persistence of such a treatment is extraordinarily long, even when fully exposed to weathering agencies, and when not so exposed it is probably much longer." This appears to be a cheap and practicable method for control of the common termite.

The biology of the American cockroach, G. E. Gould and H. O. Deay. (Ind. Expt. Sta.). (*Pests, 7 (1939), No. 9, pp. 12–15*).

The control of mole-crickets with barium fluosilicate, A. Kassab (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 193 (1939), pp. [3]+13, pls. 7*).—Barium fluosilicate bait was found to have the same insecticidal effect on the mole cricket as zinc phosphide. The formula prepared by mixing crushed maize or rice with barium fluosilicate gives nearly the maximum effect that can be expected from toxic baits under the present conditions.

The effect of calcium cyanamid on development of apothecia of Sclerotinia fructicola and on population of Taeniothrips inconsequens in prune orchards, G. A. Huber, K. E. Baur, and E. P. Breakey (*Phytopathology, 29 (1939), No. 9, p. 825*).—In studies conducted in prune orchards of Clark County,

Wash., during the spring of 1939, commercial pulverized and oiled calcium cyanamide applied to the surface of the soil and vegetative cover at the rate of 300 lb. per acre prevented the development of apothecia of *S. fructicola* and reduced the number of thrips that emerged from the soil.

The lantana bug in Australia.—Progress report, G. A. CURRIE and R. V. FYFE (*Jour. Council Sci. and Indus. Res.* [*Austral.*], *12* (*1939*), *No. 3, pp. 259–263*).—A brief report is made of the breeding work with the lantana leaf bug in the insectaries, the liberation of the bug in the field, and the resulting effect thus far on lantana, which supplements the earlier account by Fyfe (E. S. R., 78, p. 820).

Natural infection of Triatoma gerstakeri with Trypanosoma cruzi in Texas, A. PACKCHANIAN (*Pub. Health Rpts.* [*U. S.*], *54* (*1939*), *No. 34, pp. 1547–1557, pls. 10*).—The author has found *Triatoma gerstakeri*, in addition to *T. protracta* and *T. uhleri*, to be naturally infected with *Trypanosoma cruzi* and capable of transmitting this pathogenic organism in man and animals.

An annotated list of the species of Jassinae known to occur in Indiana (Homoptera, Cicadellidae), H. E. BROWN. (Purdue Univ.). (*Amer. Midland Nat.*, *21* (*1939*), *No. 3, pp. 663–673, figs. 44*).—The author adds 106 species and 1 variety to the forms of Jassinae known to occur in Indiana, making a total of 120 species and 1 variety, representing 52 genera, found to occur in the State.

Delphinium aster yellows, H. H. P. SEVERIN and S. J. OLIVER (*Phytopathology*, *29* (*1939*), *No. 9, p. 826*).—Adults of the mountain leafhopper *Thamnotettix montanus* and the geminate leafhopper *T. geminatus* are the most important vectors of California aster yellows virus to garden varieties of perennial delphiniums. When collected on naturally infected delphiniums and transferred to healthy delphinium seedlings, the former transmitted the virus to 84.6 percent and the latter to 92.3 percent of the plants. "The recovery and transfer of the virus to healthy celery from naturally infected delphiniums by previously noninfective *T. montanus* was 20.8 percent and *T. geminatus* 4.2 percent. Experimental infection of healthy delphiniums with the virus by the two species of leafhopper was as follows: Seedlings and second-year delphiniums before the spikes developed 100 percent, [and] after the spikes developed 90 percent. The incubation period of the disease in four varieties or hybrid delphinium seedlings infected during June varied from 15.4 to 28 days, average 19.5 days; in delphiniums infected during the second year before spikes developed varied from 29.2 to 64 days, or an average of 43.5 days, and after spikes developed from 28.3 to 72 days, average 45 days. In the 3 experiments on the incubation period of the disease, the virus was recovered and transferred to healthy aster or celery plants from 10 of 92 experimentally infected delphiniums, or 10.9 percent."

Occurrence of hopperburn resistance and susceptibility in the potato, T. C. ALLEN and G. H. RIEMAN. (Univ. Wis.). (*Amer. Potato Jour.*, *16* (*1939*), *No. 6, pp. 139–142*).—This contribution reports upon studies conducted during the seasons of 1937 and 1938 in southern Wisconsin following the finding in experimental potato plantings containing large numbers of varieties that potatoes definitely exhibit variability in susceptibility to the hopperburn disease. In the course of the study of the behavior of new and old potato varieties to hopperburn injury it was shown that in general the early-maturing varieties are more susceptible than the late-maturing varieties. "The hopperburn tolerance exhibited by the two recently introduced varieties, Houma and Katahdin, may readily account, in part, for the heat and drought resistance attributed by various investigators to these two new varieties. By selecting hopperburn-free and hopperburn-injured individuals in segregating seedling populations grown

under epidemic conditions in the field, it has been possible to separate segregates into two distinct levels of hopperburn tolerance. A number of seedling cultures have been isolated which show a greater degree of resistance and of susceptibility to hopperburn than any of the new or old varieties tested. Relative percentage hopperburn resistance and susceptibility have been based on the ratio of necrotic hopperburn tissue to healthy green tissue which occurred in the various potato leaf tissues under consideration."

The potato and tomato psyllid and its control on tomatoes, G. M. List (*Colorado Sta. Bul. 454 (1939), pp. 33, figs. 6*).—This is an account of the biology and control of the psyllid *Paratrioza cockerelli* (Sulc), a native of the Rocky Mountain region, which is the cause of so-called psyllid yellows of potatoes and tomatoes. Earlier information by the author on this pest has been noted (E. S. R., 73, p. 351; 80, p. 73). In reporting upon its control, it is stated that the residue after spraying with lime-sulfur and the deposit of sulfur after dusting with sulfur or spraying with wettable sulfur definitely repel the adults. "Two seasons' tests with dry and liquid lime-sulfurs, wettable sulfur, 300-mesh dusting sulfur, and gashouse dusting sulfur, failed to show any differences in the effectiveness of these materials in killing psyllid nymphs. All killed a high percentage of the nymphs. Sulfur deposits from lime-sulfur sprays, and sulfur sprays and dusts, kill nymphs that attempt to settle upon sprayed or dusted surfaces as many as 16 days after treatment. Liquid lime-sulfur, 1 part to 50 parts of water, and dry lime-sulfur, 1 lb. to 10 gal. of water, seriously retarded plant growth as shown by plant measurements. This was reflected in yield of fruit. In field control experiments in 1934 under conditions of heavy infestation, plants treated with lime-sulfur spray gave a large increase in yield over the untreated plants, even though some spray injury occurred. In 1936 under conditions of a light to a medium infestation, liquid and dry lime-sulfur sprays caused a reduction in yield as compared with the yield from untreated plants, while dusting sulfur and wettable sulfur treatments resulted in increased yields. Since population counts showed no differences in the effect of these materials in the control of the psyllids, this difference can be attributed only to the plant injury caused by the lime-sulfurs. Temperature conditions in 1938 were favorable for psyllid development. An almost complete tomato crop failure resulted on untreated plantings. Sulfur dust thoroughly applied gave good protection."

Transmission of black-raspberry mosaic by the cane-feeding aphid Amphorophora rubicumberlandi, G. A. Huber (*Phytopathology, 29 (1939), No. 9, p. 825*).—The cane-feeding aphid *A. rubicumberlandi*, recently found on both wild (*Rubus leucodermis*) and cultivated (Cumberland var.) black raspberry plants in the Puget Sound area in western Washington, has been shown in greenhouse experiments to transmit black raspberry mosaic from the wild to 30 percent of the plants of the cultivated black raspberry and from mosaic Cumberland to 50 percent of the plants of the same variety. Active colonies are difficult to maintain on mosaic-infected plants. In the field they feed only on large rapidly growing canes. "They have not been observed feeding on leaves, and seldom within 10 to 12 in. of the growing tips. *A. rubicumberlandi* has been observed feeding and reproducing on the following varieties: Black Pearl, Bristol, Conn. 36, Conn. 129, Cumberland, Dundee, Evans, Mitch seedling, Munger, Naples, New Logan, Ohio, O. S. C. 106, Plum Farmer, Quillen, and Shuttleworth. It has not been found on Black Beauty, Harbert, two Kansas seedlings, two O. S. C. seedlings, or purple cane varieties. All attempts to make it feed on varieties of red raspberry have failed."

Eradication of the citrus blackfly in Key West, Fla., W. Newell and A. C. Brown (*Jour. Econ. Ent., 32 (1939), No. 5, pp. 680–682*).—A further ac-

count (E. S. R., 82, p. 222) of the work with the citrus blackfly, which resulted in its eradication from the State of Florida in February 1937.

Matsucoccus sp., a scale insect injurious to certain pines in the Northeast (Hemiptera-Homoptera), T. J. Parr. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 5, pp. 624–630, figs. 7*).—The distribution, life history and habits, effect upon the plant tissue, cause of injury to tissue, economic importance, and natural enemies and control are reported. This pest feeds principally upon pitch pine (*Pinus rigida*), although shortleaf pine (*P. echinata*), table mountain pine (*P. pungens*), scrub pine (*P. virginiana*), and ponderosa pine (*P. ponderosa*) planted in the Northeast are attacked. White, jack, Scotch, Austrian, mugho, and red pine are all immune. Injury is most severe on pitch pine, less severe on shortleaf pine, and least on table mountain pine.

Increases in citrus scale insect infestations from heavy residue and from copper spray mixtures, H. Spencer. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 5, pp. 686–688*).—The author concludes that heavy residues from sprays containing calcium hydroxide "produced significant scale insect increases in citrus trees and that presence or absence of copper was unimportant. The experimental results suggest that a partial solution of the problem of scale build-up after bordeaux mixture might be had by reducing the residue-leaving hydrated lime in the spray to as low a quantity as horticultural or pathological considerations may permit."

Control of the purple scale and the Florida red scale, M. R. Osburn. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 5, pp. 688–690*).—In control work in Florida one application of a spray of lime-sulfur 2 gal. plus wettable sulfur 5 lb. per 100 gal. of water was found effective when applied in July in reducing purple scale population in all plats and totally ineffective in reducing infestations of the red scale. One application of a 1.6 percent oil spray reduced purple scale infestations to a greater extent than did the sulfur spray, but it was not satisfactory in decreasing infestations of the red scale.

The insect enemies of the black scale (Saissetia oleae (Bern.)) in South America, H. Compere (*Calif. Univ. Pubs. Ent., 7 (1939), No. 5, pp. [3]+75–90, figs. 9*).—A brief statement is made of the status of the black scale, followed by a report on its enemies in South America. The collection of such parasites and their shipment to California is said to have been incidental to a year's investigation of the red scale conducted by the author in South America. Of the 16 chalcidoid parasites of the black scale that were reared in South America, 5 from Brazil (2 of which were also collected in Argentina) are described as new to science and 2 represent unidentified forms.

Mealybugs and their insect enemies in South America, H. Compere (*Calif. Univ. Pubs. Ent., 7 (1939), No. 4, pp. [5]+57–73, pl. 1, figs. 5*).—This contribution, based upon studies conducted in South America in connection with the work above noted, is presented in two parts.

I. *Taxonomic studies—new Encyrtidae parasitic in mealybugs* (pp. 57–65).—In this contribution five species of mealybug-inhabiting Encyrtidae are described as new, and four species previously described are noted.

II. *Some South American mealybugs, with notice of their insect enemies* (pp. 66–70).—The observations here recorded and the collection and shipment of insect enemies of mealybugs from South America to California were made incidental to an investigation of the red scale. The species noted are *Pseudococcus comstocki* Kuw., the citrus mealybug, the long-tailed mealybug, the Mexican mealybug, the grape mealybug, and the citrophilus mealybug.

The pomegranate fruit butterfly Virachola livia Klug: Morphology, life-history, and control, A. D. Hanna (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 86 (1939), pp. [3]+54, pls. 40*).—This is a report of studies of an insect enemy

of pomegranate, the attack of which has resulted in an enormous decrease in pomegranate culture in Egypt. The contribution includes a list of 38 references to the literature.

Peach borer control with ethylene dichloride emulsion, B. F. Driggers (*New Jersey Stas. Cir. 396 (1939), pp. 2*).—A practical account of the preparation of ethylene dichloride emulsion and how and the time at which it should be applied.

Ethylene dichloride emulsion for the control of the peach borer, O. I. Snapp. (U. S. D. A.). (*Amer. Pomol. Soc. Proc., 54 (1938), pp. 83–86*).

Further studies with ethylene dichloride emulsion for the control of the peach borer, O. I. Snapp. (U. S. D. A., Ill. Expt. Sta., et al.). (*Jour. Econ. Ent., 32 (1939), No. 5, pp. 683–685*).—Tests conducted in Illinois and Georgia in continuation of earlier work (E. S. R., 80, p. 657) are reported. Ethylene dichloride emulsion was found to maintain its effectiveness early in the spring in Illinois when soil temperatures were too low for the effective use of paradichlorobenzene. "Although the soil was not prepared before treatment, ethylene dichloride emulsion gave 100 percent control of the peach borer in most of the early fall experiments in Georgia." The results obtained have shown conclusively that paradichlorobenzene crystals should not be used on young peach trees in the Southeastern States "because of the danger of serious tree injury, and that ethylene dichloride emulsion is safer than paradichlorobenzene for use even on the older trees in that area. In making a 50 percent emulsion of ethylene dichloride by a new and simplified method, 8 volumes of water are added to 1 volume of potash fish-oil soap, containing approximately 30 percent of soap, after which 9 volumes of ethylene dichloride are added and the constituents emulsified cold by pumping."

Early stages of California plume moths.—No. 1 (Lepidoptera—Pterophoridae), W. H. Lange, Jr. (Univ. Calif.). (*Bul. South. Calif. Acad. Sci., 38 (1939), No. 1, pp. 20–26, figs. 3*).

A new plume moth [Platyptilia comstocki] from Arizona (Lepidoptera—Pterophoridae), W. H. Lange, Jr. (Univ. Calif.). (*Bul. South. Calif. Acad. Sci., 38 (1939), No. 1, pp. 26–29, fig. 1*).

Parasites of the oriental fruit moth in Virginia, M. L. Bobb. (Va. Expt. Sta.). (*Jour. Econ. Ent., 32 (1939), No. 5, pp. 605–607*).—Rearings in 1937 and 1938 of the oriental fruit moth parasite *Macrocentrus ancylivorus*, which was first liberated in Virginia in 1931, and nine other species are reported upon. *M. ancylivorus* was found to be by far the most important, having represented 78.44 percent of all the individuals reared. It was responsible for the parasitism of 37.21 percent of the larvae collected, and in 1938 a parasitism of second brood larvae of 94.6 percent was found. Parasitism by *Glypta rufiscutellaris* was high in some orchards but low in others. In these studies 18.34 percent of all the parasites reared were of this species. The proportion of sexes for the parasites of all species reared in 1938 was approximately three-fourths females and one-fourth males.

Lampronia rubiella Bj., an European raspberry pest new to North America, C. W. B. Maxwell (*Canad. Ent., 71 (1939), No. 9, p. 204*).—Brief reference is made to the appearance of the lepidopteran *L. rubiella* in a cultivated raspberry plantation near Fredericton, N. B., where in May 1936 it was found injuring the buds. This is said to be the first known appearance of this European insect in North America.

Check list of the Lepidoptera of Canada and the United States of America.—II, Microlepidoptera, J. McDunnough (*Mem. South. Calif. Acad. Sci., 2 (1939), No. 1, pp. 171*).—The second and final portion of the list of Lepi-

doptera of the United States and Canada, the first of which has been noted (E. S. R., 80, p. 803).

Hibernation of anopheline eggs in the Tropics, W. S. STONE and F. H. K. REYNOLDS (*Science, 90 (1939), No. 2338, pp. 371, 372*).—Report is made of observations of the survival of *Anopheles albimanus*, *A. tarsimaculatus*, and *A. punctimacula* through the dry season in the Canal Zone.

A report of some recent studies on species of Gasterophilus occurring in horses in the United States, R. W. WELLS and E. F. KNIPLING. (U. S. D. A.). (*Iowa State Col. Jour. Sci., 12 (1938), No. 2, pp. 181–203, figs. 17*).—In this contribution the authors present some additions to the knowledge of the biology of the American forms of *Gasterophilus* infesting the horse, some elaborations on data previously published on certain phases, some facts to correct observations and interpretations reported in other publications, keys for identification of adults, and keys and figures for identification of the second- and third-instar larvae.

The use of phenothiazine in the medication of cattle for the control of horn flies, W. G. BRUCE. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 5, pp. 704–706*).—Experiments conducted to determine the value of phenothiazine in preventing the development of the horn fly larvae in cattle droppings are reported. "When various quantities of the chemical mixed with bran were fed to cattle, the minimum dose that killed all the horn fly larvae was 22 mg. per kilogram of body weight of the animal. This dose rendered the manure unfavorable for the development of horn fly larvae for approximately 24 hr., beginning 12 hr. after administration. When phenothiazine was mixed directly with the droppings, the minimum lethal dose was 4 mg. for each 100 gm. of the droppings."

Two new species of Opisocrostis (Siphonaptera), N. E. GOOD and F. M. PRINCE (*Pub. Health Rpts. [U. S.], 54 (1939), No. 37, pp. 1687–1693, figs. 4*).—Two species of fleas of the genus *Opisocrostis* Jordan, encountered on ground squirrels in several localities in Oregon, Washington, and Idaho during the course of investigations on the distribution of plague in the western United States, are described as new.

Notes and descriptions of United States scarab beetles, L. W. SAYLOR. (U. S. D. A.). (*Jour. Wash. Acad. Sci., 29 (1939), No. 10, pp. 452–459, figs. 9*).—Descriptions of 22 species are included in this account, 8 of which are new to science.

Migration and bionomics of white grubs in Iowa, 1930–1935, B. V. TRAVIS. (Iowa Expt. Sta.). (*Jour. Econ. Ent., 32 (1939), No. 5, pp. 693–697, figs. 4*).—In a study of the life cycle of *Phyllophaga* in the field in Iowa, the grubs were found to cease feeding and migrate downward for transformation from July 1 to 15. Prepupae were found from June 28 to August 24, pupae from July 6 to September 19, and the adults from August 4 to 20. Adults overwintered in the pupal cells and issued from the soil from March 27 to April 10. *Tiphia* and *Elis* parasites were found pupating at a mean depth of 10.8 in. "The first downward movement of white grubs for hibernation immediately followed the first cold weather in the fall. Downward migration began October 15 to 30 and was completed by November 14 to 16. Individual grubs collected during the first cold weather, October 17, 1930, were able to dig in unplowed ground as deep as 20 in. in 72 hr. Hibernation of the grubs occurred at a mean depth of 16 in., and pupation and overwintering of the adults at 16.6 in. The depths of hibernation and pupation were somewhat deeper in Floyd than in Decatur County, apparently because of the greater depth to the heavy clay subsoil in Floyd County rather than to climatic or specific differences."

Habits of the June beetle Phyllophaga lanceolata (Say) in Iowa, B. V. Travis. (Iowa Expt. Sta.). (*Jour. Econ. Ent., 32 (1939), No. 5, pp. 690–693*).—Observations of the biology of *P. lanceolata* in Iowa are reported.

Insecticides for June beetle control, B. V. Travis and G. C. Decker. (Iowa Expt. Sta.). (*Jour. Econ. Ent., 32 (1939), No. 5, pp. 607–611, fig. 1*).—In tests conducted in the laboratory light applications of "lead arsenate dust (1-1.5 lb. per tree) killed 74 to 90 percent of caged June beetles, moderate applications (3 lb. per tree) 81 to 95 percent, and heavy applications (4.5 lb. per tree) 88 to 98 percent. Similar applications of calcium arsenate dust killed 18 to 52 percent, 36 to 70 percent, and 51 to 84 percent, respectively. Magnesium arsenate and sodium fluosilicate did not prove effective. Lead arsenate and calcium arsenate sprays were not so effective as the dusts because the waxy coating of the leaves prevented even coverage. In field tests 80.2 percent of the beetles died after feeding on foliage dusted with lead arsenate and 29.3 percent on leaves dusted with calcium arsenate. In individual feeding tests, June beetles lived longer on foliage dusted with lead arsenate than with calcium arsenate."

Control of borers in newly set shade trees, M. D. Farrar (*Jour. Econ. Ent., 32 (1939), No. 5, pp. 634–638*).—In newly established plantings of shade trees along the highways in Illinois the flatheaded apple tree borer vigorously attacked all species present except hackberry and ash. "Wrapping with paper or burlap of that portion of the trunk not shaded by leaves gave excellent protection and reduced borer injury. Wrapping paper was superior to all other materials tested for borer protection, permanence, and low cost. Newly set trees should be wrapped for the first two growing seasons after they are set."

Potato spraying in eastern Virginia in 1938, L. D. Anderson and H. G. Walker. (Va. Truck Expt. Sta.). (*Amer. Potato Jour., 16 (1939), No. 5, pp. 114–120*).—The results of potato spraying experiments conducted in the vicinity of New Church and Onley on the Eastern Shore, in continuation of the preceding (E. S. R., 79, p. 218) and earlier years, are reported. A comparison made of the effectiveness of several different insecticides for the control of the potato flea beetle is reported upon in tables. The increases in yield on calcium arsenate-bordeaux (2–4–6–50) treated plats were found to be in accord with those previously obtained in the area. The authors conclude that potato growers would benefit materially by making the application of this mixture a standard practice. If properly applied this treatment will also control the Colorado potato beetle, the potato leafhopper, and early and late blight.

A key to the larval Bostrichidae in the United States National Museum (Coleoptera), W. H. Anderson. (U. S. D. A.). (*Jour. Wash. Acad. Sci., 29 (1939), No. 9, pp. 382–391, figs. 46*).—A key is given for the identification of the full-grown or nearly full-grown larvae of 21 species of Bostrichidae, 20 of which are represented in the larval collection of the United States National Museum.

A new anobiid beetle (Coleop.: Anobiidae) injurious to books, W. S. Fisher. (U. S. D. A.). (*Ent. Soc. Wash. Proc., 40 (1938), No. 2, pp. 43, 44*).—Under the name *Neogastrallus librinocens* n. g. and sp., a description is given of a new anobiid beetle found infesting books at St. Leo, Pasco County, Fla.

A new pest of books, Neogastrallus librinocens Fisher, E. A. Back. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 5, pp. 642–645, fig. 1*).—An account is given of the new anobiid beetle *N. librinocens*, described by Fisher as above noted, which was found in 1938 in St. Leo and St. Augustine, Fla., where it was probably introduced from Habana, Cuba. Its injury is caused by attacks upon books, bindings containing glue being most severely affected, although some books with paper covers are ruined. The feeding burrows of the larvae cut

the binding materials, causing the pages to fall out. The pages themselves may also be riddled and cut by burrowing larvae and firmly stuck together by the cementlike material emitted by the larvae in constructing their pupal chambers. The parasite *Heterospilus anobiidivorus* Mues. was found in St. Augustine and Habana and appears to be an important factor in its control.

Nutritional studies of the confused flour beetle (Tribolium confusum Duval) and the bean weevil (Acanthoscelides obtectus (Say)), S. F. Chiu and C. M. McCay. (Cornell Univ.). (*Ann. Ent. Soc. Amer., 32 (1939), No. 1, pp. 164–170*).—The "nutritional requirements of the confused flour beetle may be satisfied by a purified diet consisting of casein, cornstarch, yeast, cottonseed oil, and Osborne-Mendel salt mixture. The beetle appears unable to utilize sucrose and possibly invertase is absent from the gut of the insect. The beetle needs some factors found in yeast besides vitamin B_1. No evidence indicates any need for fat-soluble vitamins A and D or the ether-soluble material found in yeast. A technic for feeding the bean weevil a modified natural diet has been devised. The ether extract from the kidney bean appears to be essential for the growth and development of the weevil. Cholesterol can be substituted for the fat extracted from the normal diet, but development of the weevil is retarded."

The relation of nutritional levels to the growth of populations of Tribolium confusum Duv.—II, Egg production in patent flour and in patent flour supplemented with yeast, H. O. Lund and R. J. Bushnell. (Univ. Ga.). (*Jour. Econ. Ent., 32 (1939), No. 5, pp. 640–642, fig. 1*).—A continuation of the work previously noted (E. S. R., 80, p. 663).

Tests with various elm-wood traps for bark beetles, R. R. Whitten and W. C. Baker. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 5, pp. 630–634*).—The results of field tests on the attractiveness of various elmwood traps to the small European elm bark beetle and the native elm bark beetle, vectors of the Dutch elm disease fungus, commenced in 1935 and continued through 1938, are reported. It was found in 1935 that felled trees were more attractive to beetles than chemically killed trees, girdled trees, or elm logs laid and stood on the ground. In 1937 elm trees killed with certain previously untried chemicals were more attractive to the beetles than were felled trees. In comparative tests in 1938 with felled trees, girdled trees, and trees treated with sodium chlorate, ferrous sulfate, and copper sulfate, those treated with sodium chlorate were the most attractive. On two large field plats elms treated with sodium chlorate were significantly more attractive than felled elms.

A new insect introduction, L. P. Wehrle. (Univ. Ariz.). (*Bul. Brooklyn Ent. Soc., 34 (1939), No. 3, p. 170*).—Record is made of the first known collection of *Hypera brunneipennis* Boh., originally described from Egypt, in the United States. This weevil was found infesting fenugreek and alfalfa at Yuma, Ariz., in April 1939, at which time it was mistaken for the alfalfa weevil. Subsequent collections led to its being found feeding on alfalfa and sourclover in fields and ditch banks on both sides of a road for a distance of some 8 miles.

Observations on Hypera brunneipennis and its destruction in baled hay by fumigation, D. B. Mackie and W. B. Carter (*Calif. Dept. Agr. Bul., 28 (1939), No. 6, pp. 387–392, fig. 1*).—Limited observations made by the authors, together with data gathered on an Old World weevil, *H. brunneipennis*, closely related to the alfalfa weevil and discovered as reported above by Wehrle, are discussed. This obscure species without an economic record is said to feed in Arizona on a number of legumes and seemingly to favor the bitter clovers, though its hosts include alfalfa (*Medicago*) and fenugreek (*Trigonella*) and probably others.

Fumigation experiments with baled alfalfa hay, following suspension of all hay movements into California, are briefly reported. The results, the details of which are tabulated, led to the conclusion that a dosage of 2 lb. of lethal bromine per 1,000 cu. ft., or 6 lb. per car, will effectively destroy all weevil present in baled hay.

Experiments using several insecticides with and without wetting agents and stickers for boll weevil control, C. R. Rainwater. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 5, pp. 700–703*).—In experiments conducted at Florence, S. C., several insecticides were tested both alone and in combination with different commercial wetting agents and stickers. "These insecticides consisted of calcium arsenate; two nicotine compounds, one containing nicotine bentonite and the other nicotine bentonite plus nicotine tannate; two cryolite dusts, one a finely ground synthetic cryolite containing 90.8 percent of sodium fluoaluminate and the other a coarsely ground cryolite containing 78.3 percent of sodium fluoaluminate; and a mixture of calcium arsenate and calcium carbonate, which was not combined with a sticker or spreader. Statistical studies of the data showed that none of the wetting agents and stickers increased the effectiveness of the calcium arsenate or the nicotine compounds. A synthetic liquid sticker and spreader (Lethane) increased the effectiveness of the fine cryolite and made it comparable to calcium arsenate. Calcium arsenate, used alone or in combination with stickers and spreaders, and the fine cryolite were superior to the nicotine compounds, with or without stickers and spreaders. The nicotine compounds gave very little, if any, control. No significant difference occurred between calcium arsenate and the calcium arsenate-calcium carbonate mixture. From these studies and from general observations made throughout the season it appears that cryolite might be developed into a satisfactory substitute for calcium arsenate in bollweevil control, provided that its dusting qualities are good and that the percentage of sodium fluoaluminate is high."

Later than customary poisoning of boll weevils indicated as profitable in cotton production (*Miss. Farm Res.* [*Mississippi Sta.*], *2 (1939), No. 10, p. 7*).—Reference is made to further work (E. S. R., 81, p. 808) which indicates that straight calcium arsenate gives considerably better control of the bollweevil and of the cotton-leaf worm than a mixture of half calcium arsenate and half hydrated lime. It is thought that where cotton flea hopper infestations are heavy and weevils numerous a mixture of one-third calcium arsenate and two-thirds sulfur would be more helpful and profitable than straight calcium arsenate. Recent studies indicate that effective control of the bollweevil may be had much later than thought practicable until recently. It has been shown rather conclusively that it is unnecessary to poison bollweevils or flea hoppers in the State before the first or second week in July if the cotton is well protected after that time. Plants completely stripped of fruit until just before the maximum fruiting period, or until about July 10–15, and then protected by poisoning produced a better crop each year than check plats which were protected throughout the season. It is recommended that growers wait until the plants are large and fruiting heavily, then make careful infestation counts, and if 10 to 25 percent of the squares on heavily fruiting plants are being punctured about the first week in July three applications of calcium arsenate be applied.

Variations in the size of wings of some Massachusetts honeybees, C. R. Kellogg, A. E. Robinson, Jr., W. H. Moss, and L. L. Blackmer. (Mass. State Col.). (*Jour. Econ. Ent., 32 (1939), No. 5, pp. 665, 666*).

Collecting red clover pollen by honeybees, W. E. Dunham. (U. S. D. A. and Ohio Expt. Sta.). (*Jour. Econ. Ent., 32 (1939), No. 5, pp. 668–670*).—Red clover pollen counts made with a view to determining the amount of pollinating

activity performed by honeybees on red clover in one of the important seed growing areas of Ohio are reported.

Pasture improvement and the beekeeper, D. B. Johnstone-Wallace. (Cornell Univ.). (*Amer. Bee Jour., 79 (1939), No. 6, pp. 282–284, figs. 4*).

Nutritional value of certain foods for the adult honeybee, R. M. Melampy and S. E. McGregor. (U. S. D. A. and La. State Univ.). (*Jour. Econ. Ent., 32 (1939), No. 5, pp. 721–725, fig. 1*).

Comparative value of pollen and pollen substitutes.—I, Bee bread and cottonseed meal-dry skim milk mixture, M. H. Haydak. (Minn. Expt. Sta.). (*Jour. Econ. Ent., 32 (1939), No. 5, pp. 663–665*).—Practically no difference was found in the nutritive value of the bee bread and the cottonseed meal-dry skim milk mixture as judged by the development of the bees, number and quality of the bees reared, and the mortality of the experimental bees.

Ventilating the bee colony to facilitate the honey ripening process, J. F. Reinhardt. (Iowa Expt. Sta.). (*Jour. Econ. Ent., 32 (1939), No. 5, pp. 654–660, figs. 3*).—Experiments conducted, details of which are given in a table and graphs, led to the conclusion that (1) special provision for upward ventilation was effective in speeding up and completing the ripening of honey under conditions of mild weather and an abundance of nectar, (2) special ventilation is of little value to the honey ripening process when weather is hot and excessively dry or the honey flow is slight, and (3) temperature, humidity, and the character of the honey flow are important factors in the rate of honey ripening, and they determine whether special provisions for ventilation are of any effect on the speed of the honey ripening process.

The sugar concentrations of western nectars, G. H. Vansell. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 5, pp. 666–668*).—The results of determinations of sugar concentrations of nectar from several varieties of plum at Davis, Calif., in March 1935 and from blossom and extrafloral nectaries of several species of vetch in Oregon in June 1937, and the average sugar concentrations of the nectars of some western plants, are reported in tables.

The hygroscopic properties of honey, E. C. Martin. (Cornell Univ.). (*Jour. Econ. Ent., 32 (1939), No. 5, pp. 660–663*).

Physical and chemical properties of California honeys, J. E. Eckert and H. W. Allinger (*California Sta. Bul. 631 (1939), pp. 27, fig. 1*).—The authors report that a variety of honeys which differ in physical and chemical properties with their floral sources are produced by the bees of the State. The results of studies of the chemical and physical properties of the more important honeys of the State, together with some physical properties of special samples of such honeys, are presented in eight pages of tables. Thirty-seven of these different types are described, having been analyzed chemically, together with other samples of mixed origin. Specific samples are at times difficult to obtain because of the blending of honeys from different sources by the honeybee in the comb or during the extracting process. "Analysis of samples indicated that the average California honey consisted of the following components, in percentages of the total: Moisture 16.50, total sugars 77.53, levulose 40.41, dextrose 34.54, sucrose 2.53, dextrin 0.91, ash 0.21, acid 0.16, and undetermined 4.72. The levulose: dextrose ratio was 1.17, the weight per gallon 11.88 lb., and color 49, or extra light amber. The use of the refractometer to determine the moisture and sugar content of honey, as well as the weight per gallon, was found to be close enough to the chemical determinations to warrant this less expensive method in making determinations of these factors. . . . The honeydew honeys examined were shown to differ considerably in chemical and physical properties from the samples from floral sources and consequently should not be confused with the floral honeys.

While honeydew honeys cannot be considered in the class with table honeys, they should be quite acceptable to the bakery trade."

Time and temperature in relation to the destruction of sugar-tolerant yeasts in honey, G. F. Townsend (*Jour. Econ. Ent., 32 (1939), No. 5, pp. 650–654, fig. 1*).—The results of an investigation aimed at the establishment of a minimum time and temperature curve by which honey may be pasteurized are reported. Findings show that the vegetative stages of the yeasts *Zygosaccharomyces mellis*, *Z. nussbaumeri*, *Z. richteri*, *Z. nectarophilus*, and *Torula mellis*, which are those commonly causing fermentation in Canadian honeys, are destroyed when heated in a honey of 18.6 percent moisture to the temperatures and for the lengths of time shown in the graph accompanying the report.

Tests of soil treatments for the control of the fire ant (Solenopsis geminata (F.)), B. V. Travis. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 5, pp. 645–650*).—Experiments conducted in Baker County, Ga., and near Tallahassee, Leon County, Fla., are reported. "Repeated applications of sodium cyanide not only failed to eliminate fire ants from experimental areas, but the number of colonies was apparently increased by the treatments. There was, however, a large numerical reduction of ants. Single applications of sodium cyanide in solution were most effective in clay soils when poured down the galleries instead of into holes punched in the mounds. Dry cyanide treatments did not destroy so many colonies as the liquid, but the results indicate that this is a method to be considered in control campaigns. Calcium cyanide dust gave slightly better results than the sodium cyanide, but the additional cost of the chemical and the danger of handling powdered material do not justify its use over large areas. Gases of high density, such as chloropicrin, carbon disulfide, carbon tetrachloride, and sulfur dioxide, were not effective unless the applications were so large that the expense was prohibitive. Such powders as sulfur, derris, and sodium fluoride were ineffective. The most promising results with soil treatments were obtained in the spring. The evidence, however, indicates that soil treatments can effect only a temporary reduction and not an elimination of fire ant colonies."

Poisoned-bait tests against the fire ant, with special reference to thallium sulfate and thallium acetate, B. V. Travis. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 5, pp. 706–713, figs. 2*).—Poison bait tests conducted at Tallahassee, Fla., are reported, the details being given in tables and graphs. Insecticides, particularly thallium sulfate and thallium acetate commonly used as poisons for other species of ants, were tested in baits both in cages and in the field to determine their effectiveness against the fire ant. "Thallium sulfate in concentrations of 1, 1.5, and 2 percent was toxic in cage tests but not in the field. Thallium acetate in concentrations of 2, 3, and 4 percent was very effective in both cage and field tests. The addition of sodium benzoate and tartaric acid to the baits appeared to repel the ants. No satisfactory results against fire ants were obtained, either in cages or in the field, with any of the other insecticides. The habit of the fire ant to suck juices out of baits and avoid solid materials prevented a thorough study of the insoluble insecticides. Contrary to expectation, 94 percent of the fire ants starved within 10 days when confined in cages without food."

Biology and habits of Ephialtes turionellae (L.), a pupal parasite of the European pine shoot moth, P. A. Berry. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 5, pp. 717–721*).—The rearing, host relations, hibernation, oviposition, development, host resistance, feeding habits, reproductive capacity, proportion of sexes, hyperparasitic habits, and colonization of *E. turionellae*, an important pupal parasite of the European pine shoot moth in Europe, and imported and released in pine shoot moth infestations in 1933, 1934, and 1935, are

reported. No recovery of the parasite has as yet been made under field conditions.

Spermatogenesis of a haploid parthenogenetic hymenopteran, Spilocryptus extrematus [extrematis] (Cresson), C. H. Koonz (*Amer. Micros. Soc. Trans., 58 (1939), No. 3, pp. 292–303, figs. 26*).—The study here reported was conducted with *S. extrematis*, an ichneumon fly, the principal primary parasitoid of the cecropia moth.

New ichneumon-flies parasitic on the hemlock sawfly (Neodiprion tsugae Middleton), R. A. Cushman. (U. S. D. A.). (*Jour. Wash. Acad. Sci., 29 (1939), No. 9, pp. 391–402*).—Descriptions are given of eight new species of parasites of the hemlock sawfly, together with a few taxonomic and nomenclatorial notes. These include *Ischnus oregonensis, Spilocryptus neodiprionis, Aptesis (Pezoporus) tsugae, Thysiotorus latifrons, Panargyrops areolaris, Lamachus tsugae*, and *L. oregon*, all reared from the hemlock sawfly at Sweet Home, Oreg., and *Delomerista diprionis* reared from various species of *Diprion* and *Neodiprion* at Oakville, Ont., and other localities.

Present status of the European spruce sawfly (Diprion polytomum (Htg.)) in the United States, P. B. Dowden. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 5, pp. 619–624, figs. 3*).—This discussion of the European spruce sawfly deals with surveys made to determine range and seriousness of the pest, status of parasitic enemies, and the outlook for control.

A note on the Ixodoidea of Argentina [trans. title], H. de Beaurepaire Aragão (*Mem. Inst. Oswaldo Cruz, 33 (1938), No. 2, pp. 319–327; Eng. abs., pp. 324, 325*).—In this further contribution (E. S. R., 74, p. 827) a list is given of 27 species of ticks occurring in Argentina, with information on their collection and tables of their hosts and known distribution in the country, based upon new material received. The nymph of *Ixodes auritulus* Nn. is described, and the castor-bean tick, *Amblyomma parvum*, and *A. pseudo-concolor*, though known in South America, are recorded from Argentina for the first time. A bibliography of 41 titles is included.

ANIMAL PRODUCTION

The composition of different skeletal parts of experimental animals, C. E. Weakley, Jr., and R. B. Dustman (*West Virginia Sta. Bul. 294 (1939), pp. 40*).—Utilizing material from the same sources as previously described (E. S. R., 81, p. 554), data are reported on the composition of whole bones of rats, chickens, pigs, and dairy heifers, the comparisons involving analyses from animals fed normal rations and from those fed rachitic rations.

Summarizing the results, it appeared that deficiency feeding generally resulted in lighter bones of higher moisture and lower ash content, although the differences were very slight in the case of pigs. The moisture: ash ratio is considered a sensitive measure of change from the normal in mineral deposition studies. A comparison of ash on a green basis showed certain advantages over comparisons on a moisture-free, fat-free basis. A natural pairing of the leg bones with respect to moisture and ash content in relation to skeletal position was observed. The femur and humerus were higher in moisture and lower in ash than the tibia and ulna-radius, which, in turn, were higher in moisture and lower in ash than the metatarsus and metacarpus. Feeding rachitic rations to calves and chickens resulted in bone and marrow fats of a more highly unsaturated nature than those produced on normal rations. The different rations had no appreciable effect on the percentages of calcium, phosphorus, and magnesium in the ash of swine bones. Certain breed differences in the composition of swine bones are described.

[**Livestock investigations in Mississippi**] (*Miss. Farm Res.* [*Mississippi Sta.*], *2* (*1939*), *Nos. 10, pp. 5, 6, 7; 11, p. 4*).—Brief progress reports are presented for investigations on the feed lot performance of calves from native cows sired by purebred bulls of various beef breeds; a comparison of lambs from native ewes sired by purebred Hampshire, Southdown, and Corriedale rams; the use of cottonseed meal in swine-fattening rations; a comparison of cottonseed meal, soybean oil meal, and tankage as protein supplements for hogs on alfalfa pasture; the value of lespedeza hay for wintering work stock; the value of pasture for reducing the barn-feeding requirements of work animals; the value of cottonseed cake and alfalfa hay in a ration of working mules; the influence of rations on the reproductive capacity of stallions and jacks; dairying as a supplement to cotton farming; the carrying capacity of Delta land pastures; and the use of green crops for laying hens.

[**Livestock investigations in Oregon**] (*Oregon Sta. Bul. 359* (*1938*), *pp. 16, 19, 20–26, 28–30, 31, 32–34, 80–84, 85, 86, figs. 13*).—Included are brief reports of investigations on the value of chopped v. hammered alfalfa for fattening calves; the efficient use of home-grown feeds in fattening cattle; methods of feeding ewes and their lambs; wheat v. barley for fattening lambs; the use of western Oregon feeds for fattening eastern Oregon lambs; methods of wintering range ewes; the relative palatability of different varieties of grass for sheep; the comparative performance of Hampshire, Rambouillet, and Lincoln × Rambouillet sheep in farm flocks; the need of iodine in the ration of breeding mares; a comparison of wheat, kapok oil meal, and coconut oil meal for swine; the effect of kapok oil meal, coconut oil meal, and garbage in swine rations on the quality and palatability of pork; and numerous phases of livestock grazing and range management problems.

Poultry investigations reported include battery cages v. floor pens for chicks and laying hens, methods of feeding yearling hens during molt, the value of yeast in laying rations, factors affecting the occurrence of crooked keels in laying pullets, a comparison of fall- v. spring-hatched pullets, a comparison of rations with and without corn for chickens and laying hens, turkey improvement through breeding and selection, the use of home-grown feeds in turkey production, and the effect of fish meals and oils on the odor and flavor of turkey meat.

[**Livestock investigations in Pennsylvania**] (*Pennsylvania Sta. Bul. 382* (*1939*), *pp. 10, 29–31, 32, 33, 59, 60, figs. 2*).—Studies, for which results are briefly noted, include: A comparison of corn silage, alfalfa-molasses silage, and alfalfa hay as roughages for fattening steers, by P. T. Ziegler; the value of soybean oil meal for growing lambs, by T. B. Keith; the optimum protein levels for growing fattening swine, by Keith and R. C. Miller; pumping as an aid in the pickle curing of hams, by Ziegler and Miller; the effect of environmental temperature on the utilization of feed energy, the dynamic effects of individual nutrients, the dynamic effects of body nutrients of cattle in relation to net energy values, and the effects of deficiencies in essential nutrients on the energy value of feeding stuffs, all by E. B. Forbes; the role of manganese in animal nutrition, by N. B. Guerrant; and the specific dynamic effects of amino acids, by M. Kriss.

From poultry investigations, results are reported on the optimum requirements of young chicks for vitamin A and the rate of loss of vitamin A from feeds during storage, by R. V. Boucher; optimum levels of riboflavin in laying rations, by Boucher and H. C. Knandel; the influence of interior egg quality on hatchability, and the inheritance of interior egg quality and egg shape, both by D. R. Marble; the rate and economy of meat production by Nittany and Bronze

turkeys, by P. H. Margolf; and the nutrition of game birds, by E. W. Callenbach and Boucher.

The protein requirements of farm animals (*Ohio Sta. Spec. Cir. 58 (1939), pp. 12*).—Practical recommendations are offered concerning the protein requirements and important sources of protein for beef cattle, sheep, dairy cattle, swine, and poultry.

Plant proteins, III–VI, D. B. Smuts and J. S. C. Marais (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 11 (1938), Nos. 1, pp. 151–159; 2, pp. 391–416, fig. 1*).—Further reports of this series of investigations are noted (E. S. R., 80, p. 809).

III. *The supplementary effect amongst certain plant proteins* (pp. 151–159).—In a series of paired feeding experiments and nitrogen metabolism tests with rats, the addition of a small amount of cystine to alfalfa significantly improved the growth-promoting properties and the biological value of the latter. Likewise, the protein supplied by a combination of peanut meal and oatmeal was superior to that of peanut meal alone. No supplementation was found to exist between peanut meal and alfalfa meal.

IV. *The biological values of soyabeans, linseedmeal, and soyabeans supplemented by cystine* (pp. 391–397).—Nitrogen metabolism tests with rats on rations supplied with protein from soybeans, soybeans plus 0.2 percent cystine, or linseed meal revealed biological values of these proteins of 55, 74, and 78, respectively.

V. *The biological value of lucerne and lucerne supplemented by cystine in sheep* (pp. 398–406).—In nitrogen balance experiments with mature sheep the biological value of alfalfa protein was not enhanced by the addition of cystine to the diet. The apparent and true digestibilities of alfalfa protein were 75 and 91 percent, respectively, while comparable values for the alfalfa plus cystine protein were 61 and 80 percent, respectively. Apparently cystine is not a limiting factor in alfalfa protein when fed to mature sheep.

VI. *The amino acid deficiencies in certain plant proteins* (pp. 407–416).—Investigating by means of paired-feeding experiments with rats the possible deficiencies of indispensable amino acids in certain plant proteins, it was found that peanut meal was not deficient in cystine, tryptophane, or lysine, but may be deficient in methionine. Copra meal did not prove to be deficient in cystine, while linseed meal and soybean meal were definitely deficient in this amino acid.

The effect of heat and solvents on the nutritive value of soybean protein, L. M. Johnson, H. T. Parsons, and H. Steenbock. (Wis. Expt. Sta.). (*Jour. Nutr., 18 (1939), No. 4, pp. 423–434*).—In an effort to substantiate earlier findings on the beneficial effect of heat on the nutritive value of soybean protein (E. S. R., 76, p. 669), sulfur and nitrogen balances were determined on rats receiving expeller-type soybean oil meal (150° C.), raw whole soybeans, autoclaved whole soybeans, and both raw and autoclaved soybeans extracted with ether, hexane, or a hexane-methanol mixture. The amount of sulfur and nitrogen absorbed was essentially the same on all diets, but the amounts retained were markedly higher on the heat-treated expeller meal or the autoclaved soybeans than on the raw soybeans. The raw solvent-extracted soybeans gave essentially the same results as the raw whole beans, indicating that the solvent treatment had little influence on nutritive values. It appears that soybeans contain a sulfur- and nitrogen-containing complex which is absorbable but cannot be used for tissue-building purposes, and that heating the soybeans makes it available.

The feeding value of apples, C. W. Holdaway. (Va. A. and M. Col.). (*Va. Fruit, 27 (1939), No. 10, pp. 14, 15*).—The experimental work on the utilization of apples for animal feeding is briefly reviewed.

The stability of vitamins A and D in mixed feed ingredients.—II, Vitamin A, F. D. Baird, A. T. Ringrose, and M. J. MacMillan (*Poultry Sci., 18 (1939), No. 6, pp. 441–448, fig. 1*).—Continuing this report (E. S. R., 81, p. 257), it was found that vitamin A from fortified cod-liver oil, when mixed in a ration and stored in burlap bags at summer temperature, underwent progressive destruction as the storage period progressed. However, complete destruction did not occur over 25 weeks of storage. A ration containing 150 units of vitamin A per 100 gm. from cod-liver oil added at weekly intervals supplied an adequate amount of vitamin A for growing chicks, whereas a ration containing 200 units fed after 8 weeks of storage was inadequate in this respect. A ration containing 300 units and fed after 21 weeks of storage supported practically normal growth.

The stability of vitamin A from cod liver oil in mixed feeds, R. C. Holder and S. K. Ford (*Poultry Sci., 18 (1939), No. 5, pp. 345–349*).—In two separate experiments, each of 8 weeks' duration, with growing chicks comparing the vitamin A potency of feeds which had been stored for 60 days at 70° to 80° F. after cod-liver oil had been added with similar feeds in which cod-liver oil was added in equivalent amounts at 5-day intervals during the course of the feeding trial, no loss of the vitamin A in the stored feed could be detected. There was evidence of a slight loss of vitamin A in the stored feeds when one lot was continued on test for 10 weeks. In one experiment 150 units of vitamin A per 100 gm. of ration mixed in the feed and stored for 60 days supplied the minimum vitamin A requirement of the chicks for 8 weeks, but in the other experiment this level proved slightly inadequate.

Carotene in hay conserved by care in curing process, O. A. Leonard (*Miss. Farm Res. [Mississippi Sta.], 2 (1939), No. 11, pp. 2, 7*).—A study of the distribution of carotene in different parts of alfalfa, soybean, sweetclover, and Johnson grass plants indicated a relatively high content in the leaves, a much lower content in the upper part of the stems, and still less in the lower part of the stems. The leaves made up less than 50 percent of the weight of these plants, yet they contained over 90 percent of the total carotene. Data on the loss of carotene during the curing of these plants indicated that curing in the shade for from 24 to 30 hr. resulted in a loss of one-half to three-fourths of the initial amount of carotene, while drying in the sun for the same period resulted in still greater losses. Similar losses occurred in crushed and uncrushed hays during field curing.

Cystine and methionine requirements for growth and lactation, J. R. Haag and L. D. Wright. (Oreg. State Col.). (*Science, 90 (1939), No. 2329, p. 158*).—In a further report of this line of investigation (E. S. R., 81, p. 405), it is noted that when cystine and methionine were fed with peanut meal proteins the cystine did not significantly improve the growth- or lactation-promoting properties of the peanut meal protein, while the methionine improved both properties. It appeared that the combined requirements for cystine and menthionine and the conditions governing their interchangeability are of essentially similar orders for growth and lactation.

Synthetic alpha-tocopherol and nutritional muscular dystrophy, S. G. Morris. (U. S. D. A.). (*Science, 90 (1939), No. 2340, pp. 424, 425*).—Rabbits suffering from muscular dystrophy induced by feeding a ration of alfalfa hay and grain supplemented with cod-liver oil were given single doses of synthetic α-tocopherol ranging from 17 to 65 mg. All animals were cured except the one receiving the lowest level, suggesting that 20 mg. is near the lower limit as a single curative dose. Spontaneous cure of this disorder has never been observed among several hundred dystrophic rabbits.

Role of vitamin E in the prevention of muscular dystrophy in guinea pigs reared on synthetic rations, N. Shimotori, G. A. Emerson, and H. M. Evans. (Univ. Calif.). (*Science, 90 (1939), No. 2326, p. 89*).—Guinea pigs maintained on a synthetic diet similar to that described by Madsen et al. (E. S. R., 74, p. 82) consistently developed severe muscular dystrophies. Supplementing this diet with 0.5–0.75 cc. of wheat germ oil per animal daily or 3 mg. of α-tocopherol per animal on alternate days completely prevented the occurrence of this disorder.

Effect of cobalt on erythropoiesis in anemic rabbits, W. Kleinberg, A. S. Gordon, and H. A. Charipper (*Soc. Expt. Biol. and Med. Proc., 42 (1939), No. 1, pp. 119, 120*).—Artificially induced anemias were produced in rabbits either by repeated bleedings or by injections of benzol. Injections of cobalt, as cobalt nitrate, into these animals resulted in a rapid recovery from the anemia, apparently due to the stimulation of the formation of erythrogenic precursors in the bone marrow.

Sulphur metabolism, VI–VIII, J. H. Kellermann (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 11 (1938), No. 1, pp. 107–112, 113–119, 121–128, fig. 1*).—Three additional reports in this series are noted (E. S. R., 80, p. 810).

VI. *The effect of various levels of fats and proteins in the ration on the toxicity of elementary sulphur.*—In rat-feeding tests with sulfur-supplemented rations of low- and high-protein content, the growth-promoting value of the low-protein ration (8.5 percent) was significantly greater per unit of protein consumed than that of the high-protein ration (34 percent). Males utilized these rations significantly better than females. Comparing a series of high- and low-fat diets, the addition of 3 percent of elementary sulfur to the diets significantly lowered the animal's efficiency of feed utilization regardless of the fat level. No consistent pathological changes were related to the sulfur feeding.

VII. *The effect of the acid-base balance of the ration on the toxicity of elementary sulphur.*—A series of diets varying in acid: base balance, each with and without supplementary sulfur, was compared in rat-feeding trials. The efficiency quotient on the base-forming rations was significantly better than on the acid-forming ones, but in either case the addition of elementary sulfur to the diet significantly lowered the efficiency index. No pathological changes attributable to diet were observed.

VIII. *The effect of incomplete rations on the toxicity of elementary sulphur.*—In similar experiments, 14 experimental diets containing isodynamic quantities of energy but varying in mineral, vitamin, and protein contents were compared. The inclusion of sulfur in such diets exerted toxic effects only when the basal ration itself would not support normal growth due to a deficiency of one or more necessary factors. The chief effect of sulfur in such cases was to reduce feed consumption per animal, but not per unit of body weight. Vitamins, proteins, and minerals were adjudged equally important in counteracting the deleterious effects of sulfur.

Commercial feeds in Kentucky in 1938, J. D. Turner, H. D. Spears, W. G. Terrell, and J. J. Rose (*Kentucky Sta. Regulat. Ser. Bul. 21 (1939), pp. 53*).—A summary of the inspection and analyses of 1,538 samples of commercial feeding stuffs, together with the guaranteed and found analyses of 63 samples of canned dog feeds and information on the properties of substances commonly used in mineral mixtures, are presented (E. S. R., 80, p. 84).

Analyses of commercial feeding stuffs and registrations for 1939, C. S. Cathcart (*New Jersey Stas. Bul. 664 (1939), pp. 73*).—A summary of the results of the 1938 feed inspection and a tabulation of the guaranteed and found analyses of 1,555 samples of feeds are presented (E. S. R., 80, p. 84).

Beef cattle: Their feeding and management in the Corn Belt States, R. R. SNAPP (*New York: John Wiley & Sons; London: Chapman & Hall, 1939, ed., rev., pp. [2]+X+550, pl. 1, figs. 103*).—The third revision of this treatise is enlarged and brought up to date while retaining the same general organization as earlier editions (E. S. R., 63, p. 856).

Preliminary report of beef cattle feeding investigations, Z. A. MASSEY (*Georgia Sta. Cir. 119 (1939), pp. 4*).—The results of three feeding trials with beef cattle are presented in tabular form. In the three trials comparing peanut meal and cottonseed meal as protein concentrates with either peanut hay or silage as a source of roughage there was little difference in the rate or economy of gain between the various lots. In the second and third trials, additional lots were included to compare ground and unground peanut hay. The rate of gain and feed cost per unit of gain favored the ground hay ration.

The assimilation of calcium and phosphorus by the growing bovine, J. S. OTTO (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 10 (1938), No. 2, pp. 281–364, figs. 2*).—A comprehensive review of the literature with 134 citations is presented, along with a detailed description of both short-time balance trials and long-time metabolism experiments conducted with cattle. In general, the quantity of calcium or phosphorus present in the ration limited the retention of the other element. Varying the intake from the optimum resulted in less efficient utilization of both elements. The quantities of calcium and phosphorus present in the ration determined, more than any other factor, the quantities of these minerals retained in the animal body.

The endogenous nitrogen metabolism of sheep, with special reference to the maintenance requirement of protein, D. B. SMUTS and J. S. C. MARAIS (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 11 (1938), No. 1, pp. 131–139, figs. 4*).—Sheep maintained on a nitrogen-free diet attained the endogenous nitrogen level in from 6 to 15 days, depending on the protein content of the ration during the preliminary feeding period. The nitrogen requirement for maintenance, based on the total nitrogen excretion in the urine of mature sheep on the nitrogen-free diet, was found to average about 0.041 gm. per kilogram of body weight daily. Assuming an average biological value of proteins of 50, this becomes equivalent to about 23 gm. of digestible protein per 100 lb. live weight daily, which is less than that advocated in the usual feeding standards.

A histological technique for the estimation of follicle population per unit area of skin in the sheep, H. B. CARTER (*Jour. Council Sci. and Indus. Res. [Austral.], 12 (1939), No. 3, pp. 250–258, fig. 1*).—In this contribution from the University of Sydney a method based upon the preparation and charting of small skin snippets from the living animal is described. The method is recommended not only as suitable for wide application in fleece analysis for general biological purposes but as likely to prove of greatest value in genetical studies.

The influence of different factors on the wool production of mother sheep of Swedish races [trans. title], I. JOHANSSON and L. BERG (*Ztschr. Tierzücht. u. Züchtungsbiol., 43 (1939), No. 3, pp. 370–380, figs. 2*).—Studies of the wool production of Oxford, Shropshire, Cheviot, and Swedish domestic breeds showed that by shearing twice a year wool yield was increased an average of about 11.6 percent over shearing once a year. Pregnant ewes sheared the largest fleeces at from 2 to 6 yr. of age. The positive correlation between the weight of fleece and body weight suggested that there was a regression of 0.24 kg. of wool for each 10 kg. of body weight. The analysis of variance between individuals of the flocks led to the conclusion that not over one-third of the variation in wool was genetic.

An experimental study of inbreeding and outbreeding swine, O. S. WILLHAM and W. A. CRAFT (*Oklahoma Sta. Tech. Bul. 7 (1939), pp. 48, figs. 5*).—The results of eight generations of moderately intense inbreeding with Duroc-Jersey hogs are summarized. The eighth-generation inbreds had a coefficient of inbreeding of 47.6 percent. The inbred litters decreased from 8.9 pigs in the first generation to 5.3 pigs in the eighth, while outcrossed litters over the same period averaged 9.3 pigs. The percentage of still-born pigs was similar in both groups. Inbred pigs averaged 2.13 lb. birth weight and outbred pigs 2.47 lb., with the greatest decrease in birth weight of inbreds occurring in the first generation. Inbred sows weaned fewer pigs, and these were lighter in weight at weaning age than those from outbred sows. The percentage of inbred pigs reaching weaning age declined from 76 percent in the first to 44 percent in the eighth generation. Inbred pigs made slower daily gains throughout the period from birth to market weight and required about 21 lb. more feed per 100 lb. of gain than outbred pigs. The inbreds had a significantly lower coefficient of digestibility for protein and nitrogen-free extract. However, they were more uniform in their feed requirement per unit of gain than outbred pigs. The inbred sows bred as regularly as the outbred sows, and the inbred boars mated readily with the inbred sows. Inbred boars, compared with outbred boars in diallel crosses, did not produce any more uniform pigs than the outbred ones. Pigs sired by inbred boars out of outbred sows made slower daily gains during the latter part of the feeding period than outbred pigs. Inbred pigs did not recover their hemoglobin level following the first week of age as quickly as the outbreds, and death losses during the growing and fattening periods were higher in the former. It appeared that certain genes favorably affecting growth were lost or that combinations of genes producing slow growth were fixed in the earlier generations of inbreeding. Certain characteristics became fixed in some individuals among the inbreds. The same types of abnormalities occurred in both groups, but with less frequency among the outbreds.

Pig husbandry: An experiment on the use of dried potatoes, J. K. THOMPSON ET AL. (*Kirton Agr. Jour., No. 3 (1939), pp. 58–72*).—When potato flour was introduced into the ration of growing fattening bacon pigs at 7- and 10-percent levels in partial substitution for barley meal the carcasses contained less fat and a lower degree of finish than the controls. These differences were more pronounced at the higher level of potato flour feeding. Extensive data are presented on the growth and feed consumption of the pigs and the weights and measurements recorded after slaughter.

Feeding sorghum grain to growing and fattening pigs, M. L. BAKER and C. F. REINMILLER. (Coop. U. S. D. A.). (*Nebraska Sta. Bul. 323 (1939), pp. 8*).—Summarized in this report are the results of four separate feeding trials, involving nine comparisons of shelled corn with various sorghum grains for growing and fattening pigs. In each instance the grain and the protein concentrate mixture were self-fed. Sorghum proved fully as palatable as corn. Gains made by the pigs fed sorghum averaged as rapid as those by the corn-fed groups. On the basis of the amount of feed required per unit of gain, whole milo, ground milo, whole kafir, ground kafir, whole kalo, and ground kalo averaged 90, 90, 89, 91, 87, and 91 percent, respectively, as efficient as shelled corn. Thus the difference between the grain sorghums appeared negligible. Grinding the sorghum grains appeared to be of doubtful economy, showing in only one instance, where a very dry, hard sorghum had been stored for a long period, a marked advantage. The sorghum-fed pigs produced carcasses practically equal in yield, finish, firmness, and grade to those from corn-fed pigs.

Qualities of hams and rapidity of aging as affected by curing and aging conditions and processes, **W. E. Hunt, W. C. Supplee, D. Meade, and B. E. Carmichael** (Coop. U. S. D. A.). (*Maryland Sta. Bul. 428 (1939), pp. 51–84, figs. 9*).—The results of 9 yr. of comprehensive study on the production of home-cured hams are summarized. Hams varying in weight from 6 to 20 lb., representative of those produced under different methods and levels of feeding, were cured, smoked, and aged under varying conditions as described. Mechanical separation, chemical and bacterial analyses, palatability tests, and shrinkage measurements were carried out under different procedures. The standard cure for control hams consisted of applying (in three applications) a dry mixture of 8 lb. of salt, 2 lb. of granulated sugar, and 3 oz. of saltpeter per 100 lb. of ham. In the early years of the study hams were aged at ordinary room temperature without temperature control. Under these conditions hydrolytic changes in the fat and lean meat and an increased concentration of salt occurred with aging. Fat hydrolysis during the early months of aging was more rapid in the fat of the lean than in the fat of the adipose tissue, with evidence that the relationship of moisture to fat in the tissue was important in governing the rate of hydrolysis. Unsaturated fatty acids were freed at a more rapid rate than saturated acids during the early stages of aging, but this ratio narrowed rapidly as hydrolysis proceeded. An increased content of both total soluble nitrogen and soluble amino nitrogen consistently occurred with aging. In later trials hams were aged in specially constructed incubators with a thermostatic temperature control over a temperature range of from 91° to 126° F. Those aged at 108° for from 10 to 12 weeks were of the best quality, comparing favorably in chemical composition and palatability with hams aged for 1 yr. or longer at ordinary room temperature. Bacteriological data indicated that enzymes of bacterial origin probably play a minor role as compared with tissue enzymes in promoting hydrolysis.

Two types of molds, as described, were found to be associated with the aging of hams. As aging increased a slight tendency for black and red in the lean to increase was noted, while the most pronounced color change was the increase in red and yellow and, to a less extent, black in the fat. Hams aged longer than 10 weeks at 108° increased in saltiness and intensity of aged flavor. Hams injected with proteolytic enzymes aged somewhat more rapidly than untreated ones, with the flavor and odor imparted by the enzyme treatment generally proving objectionable. Allowing cured hams to air-cure for 2 weeks prior to smoking was considered desirable if attempts were made to cure with a minimum salt concentration.

Hams smoked immediately after curing lost their smoky aroma and uniform color with aging and could not be distinguished from unsmoked hams aged in the incubator. Smoking after aging was of value only for removing excess moisture. Such hams showed no evidence of smoking after cooking. Dry-cured hams had less shrinkage by the time they were cooked than brine-cured or brine-cured tallow-covered hams. Hams aged in the incubator shrank less with the same degree of aging than those aged at room temperature. Hams rapidly aged at high temperature were satisfactorily held for later use at storage temperatures of 34° or lower.

Is running fits a deficiency disease? **A. Arnold and C. A. Elvehjem** (Wis. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. 750, pp. 303–308, figs. 4*).—A simplified diet composed of wheat and meat scrap, processed by dry heat and fed in a coarsely ground condition, consistently induced running fits within a few days when fed to dogs as a sole article of diet. The addition of 5 percent of crude casein or 10 percent of dry canned dog food to the basal

diet failed to prevent this disorder, but the addition of 10 percent of purified casein prevented this condition for a period of 60 days. When the casein was withdrawn from the diet the disorder developed within 8 days. Adding dry canned dog food at a level to supply approximately 10 percent of protein to the heated diet protected against the running fits. It appeared that the protective action of the protein was primarily dependent upon the added supply of lysine.

[Poultry Science Association, thirty-first annual meeting] (*Poultry Sci., 18 (1939), No. 5, pp. 399–414*).—Abstracts of 40 papers presented before the meeting held at Cleveland, Ohio, August 1–3, 1939, are noted as in previous years (E. S. R., 80, p. 527).

Poultry production, W. A. LIPPINCOTT, rev. by L. E. CARD (*Philadelphia: Lea & Febiger, 1939, 6. ed., rev., pp. 603, pl. 1, figs. 215*).—The sixth edition of this popular textbook is noted (E. S. R., 71, p. 684).

Crossbreeding for egg production, F. P. JEFFREY (*New Jersey Stas. Hints to Poultrymen, 26 (1939), No. 5, pp. 4*).—Briefly summarizing the results of a cross-breeding experiment, in which a low egg-producing strain of Rhode Island Reds was crossed with a good egg-producing strain of Barred Plymouth Rocks, it was found that the hybrids gave superior results in respect to fertility, percentage hatchability of fertile eggs, rate of growth to 12 weeks of age, viability during the growing period, age at first egg, and egg weight at 10 mo. The hybrids were intermediate or inferior to the standard breeds in respect to adult body weight, laying house mortality, and egg production over 11 mo.

The basal metabolism of 3 to 4 weeks old White Leghorn chickens, D. B. SMUTS and J. S. C. MARAIS (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 11 (1938), No. 1, pp. 141–149, fig. 1*).—Based on the body surface area determination of 17 chickens by the mold method, a formula $S=36.31\ W^{0.647}$ was derived, in which S is the surface area in square centimeters and W the weight in grams. The basal heat production of 1-month-old chickens expressed per square meter of body surface was found to be 891 calories per day. The highest basal metabolism of chickens was reached between 3½ and 4½ weeks of age.

Methods of feeding laying hens, E. I. ROBERTSON, J. S. CARVER, and J. W. COOK (*Washington Sta. Bul. 381 (1939), pp. 15, figs. 3*).—Five methods of feeding laying hens were compared, duplicate lots of White Leghorn pullets being fed by each method over nine 28-day periods. The basal mash was self-fed in methods 1 to 4, while grain was fed as follows: (1) Included in an all-mash ration (mash 7: grain 3), (2) grain fed in litter at 4 p. m. at the rate of 7 lb. per 100 birds, (3) grain fed in hoppers at 4 p. m., 7 lb. per 100 birds, and (4) the same as in method 2 plus pellets of the basal mash fed at the rate of 5 lb. per 100 birds. Under the fifth method the birds were offered a free choice of corn, wheat, and oats and a high-protein concentrate.

Egg production was highest and feed cost per dozen eggs was lowest and also variation in yolk color was greatest when the hens had free access to grains and concentrates. Egg production was lowest and feed cost highest under the all-mash system. The supplemental feeding of pellets showed no advantage in egg production when feed cost was considered. Mortality apparently was not affected by the method of feeding. All of the methods, except the all-mash feeding, gave practically equal results in egg production and are to be recommended.

The response of laying hens to sudden feed changes, G. R. SIPE and H. D. POLK. (Miss. Expt. Sta.). (*Poultry Sci., 18 (1939), No. 5, pp. 394–398*).—A pen of White Leghorn pullets of uniform breeding, placed on test on October 1, was subjected to abrupt changes in type of ration on December 1, March 1, June 1, and August 1. The average mortality in this group during the year was no

... than normally occurred, and there was no evidence that the sudden changes in feed reduced egg production during the first month after the change or caused the birds to molt. Egg production was slightly lower during the second month after change, but this is attributed to the cycle of production rather than to the feed change. Hens completing the experimental laying year averaged 157.7 eggs each, while in four comparable pens of birds which were fed one type of ration throughout the year the average production was 136.25 eggs per bird.

The effect of different cereals on the composition of the edible portions of cockerels, H. M. Harshaw. (U. S. D. A.). (*Poultry Sci., 18 (1939), No. 6, pp. 486–491*).—Based on the same analytical methods as previously described (E. S. R., 79, p. 525), data are presented on the average physical and chemical composition of five lots of 12-week-old White Leghorn cockerels reared on a normal all-mash ration or on one containing only one of the four cereals, corn, wheat, oats, or barley. All rations were balanced to contain approximately 16.6 percent protein and a favorable calcium: phosphorus ratio. Compared with the controls, the oat- and barley-fed lots had approximately the same proportion of leg and breast muscle, while the wheat- and corn-fed lots were considerably lower in this respect. The percentage of the remaining edible portion was nearly equal for all groups. In order of the total edible portion the five lots ranked: Control, oats, barley, wheat, and corn, with the corn lot approximately 11 percent lower than the controls. Corn-fed birds had the highest fat content of the edible portions, followed in order by those fed the wheat, control, barley, and oat diets, with little difference between the last two. The percentage of protein, ash, and water in the edible portions varied inversely with the fat content in all cases. However, the edible portion of the wheat-fed birds consistently contained less protein than that of birds in other groups. The cereals used caused no appreciable difference in the distribution of fat between the edible portions.

A method for determining the gross value of protein concentrates, V. Heiman, J. S. Carver, and J. W. Cook. (Wash. Expt. Sta.). (*Poultry Sci., 18 (1939), No. 6, pp. 464–474, figs. 3*).—The described method consists of subjecting young chicks to a protein-depletion period on a low-protein diet of cereal sources, but adequate in all respects except for protein. After depletion and standardization as to body weight, test groups received an experimental diet containing 3 percent of protein from the supplement being assayed. The increase in body weight during the first 2-week test period over those on the basal diet was used as a measure of gross protein value. These values were compared with those obtained after feeding casein, which was arbitrarily given a value of 100. By this method gross protein values of 58.5, 105, 93, 88, 13, 5, and 4 were attained for hydraulic soybean oil meal, herring fish meals A and B, skim milk, alfalfa leaves (10-in. plant), alfalfa leaves (24-in. plant), and alfalfa hay (10-in. plant), respectively. In an experiment in which casein and the hydraulic soybean oil meal were compared under conditions simulating common feeding practice, the value of the latter was 56.3.

Utilization of energy of wheat products by chickens, G. S. Fraps and E. C. Carlyle. (Tex. Expt. Sta.). (*Jour. Nutr., 18 (1939), No. 4, pp. 385–398*).—Employing the same experimental technic as previously described (E. S. R., 81, p. 408), tests were conducted to compare the productive energy values for young growing chickens of patent flour, low-grade flour, wheat brown shorts, and wheat bran, with corn meal as a standard. The feeds to be compared were fed as half of a ration otherwise constant. With the productive energy value of corn meal at 25 calories per 100 gm., the relative productive energy values of the patent

flour, low grade flour, wheat brown shorts, and wheat bran were 188, 187, 86, and 61, respectively. With the relative productive energy values of the effective digestible nutrients of corn meal at 278, corresponding values for the above feeds were 236, 251, 179, and 173, respectively, and with the relative productive energy value of the metabolizable energy of corn at 61, corresponding values were 53, 57, 41, and 41, respectively. Thus, when measured by gains of energy in protein and fat of growing chickens, neither the total nutrients, the digestible nutrients, nor the metabolizable energy are correct measures of the feeding value of these feeding stuffs.

Further studies on the nature of the effective supplements for soybean oil meal in chick rations, J. B. Christiansen, H. J. Deobald, J. G. Halpin, and E. B. Hart (Wis. Expt. Sta.). *(Poultry Sci., 18 (1939), No. 6, pp. 481–485)*.—In two experiments, involving a total of 12 experimental rations in addition to the negative and positive controls, casein, dried skim milk, whey, dried milk albumin, yeast, autoclaved yeast, meat scrap, liver meal, and sardine meal were used singly or in combination to supplement soybean oil meal in the ration of growing chicks. The protein of grains supplemented solely by soybean oil meal proved inefficient and required additional supplementation with other proteins for maximum efficiency. Each supplement, with the exception of dried albumin, enhanced the growth-promoting properties of the soybean oil meal ration. Since albumin had no value as a supplement, it appeared that the supplemental value of whey was due to its vitamin content. Other data indicated that a potent source of flavin and possibly other vitamins must be fed for maximum efficiency of utilization of the soybean oil meal. A combination of meat scrap and liver meal as a supplement induced more rapid growth than either supplement alone.

The effect of substituting an all-mash and pellet ration for grain, mash, and pellets on flock production, costs, and returns, C. E. Lee, S. W. Hamilton, C. L. Henry, and M. E. Callanan *(Poultry Sci., 18 (1939), No. 5, pp. 375–377)*.—A trial extending over 10 mo., in which pens of White Leghorns and Rhode Island Reds in both heated and unheated laying houses received rations of mash, grain, and pellets v. all-mash rations plus pellets, gave evidence that the all-mash ration, even though supplemented with pellets, caused significantly lower egg production, higher feed cost per bird, materially higher feed cost per dozen eggs, and lower net return above feed cost than the mash and scratch grain supplemented with pellets. The spread in returns between the two systems of feeding was less in the heated than in the unheated houses.

Shark liver oil—a potent source of vitamin A for poultry, L. L. Rusoff and N. R. Mehrhof. (Fla. Expt. Sta.). *(Poultry Sci., 18 (1939), No. 5, pp. 339–344)*.—The growth rate and feed consumption of chicks receiving graded levels of shark-liver oil, ranging from 13.3 to 40 mg. per 100 gm. of ration, were compared with that of the control lot receiving 40 mg. of U. S. P. reference cod-liver oil per 100 gm. of basal diet. Chicks receiving even the lower level of shark-liver oil compared favorably in rate of growth with the control lot, indicating that the shark-liver oil contained approximately three times as much vitamin A as the reference cod-liver oil. These results agreed closely with the vitameter determinations for vitamin A in the shark-liver oil.

Vitamin B_6 deficiency in chicks, T. H. Jukes. (Univ. Calif.). *(Soc. Expt. Biol. and Med. Proc., 42 (1939), No. 1, pp. 180–182, fig. 1)*.—Chicks maintained on a synthetic diet containing adequate amounts of all known essential dietary factors except vitamin B_6 exhibited slow growth, depressed appetite, and inefficient utilization of food, followed in some cases by spasmodic convulsions and death. These symptoms were prevented by adding synthetic vitamin B_6 hydrochloride to the basal diet at the rate of 0.3 mg. per 100 gm. of ration.

The carotenoid nature of yellow pigment in the chicken iris, W. F. HOLLANDER and R. D. OWEN. (Wis. Expt. Sta.). (*Poultry Sci., 18 (1939), No. 5, pp. 385–387*).—Microscopic examination of the iris of chickens and pigeons revealed that in the former irregular masses and globules of yellow material were present, while in the latter a finely granular yellow pigment was distributed throughout the iris tissue. Solubility tests indicated that the yellow pigment of the chicken iris was composed of carotene and xanthophyll, while no carotenoids were found in the iris of the pigeon.

The importance of riboflavin in reproduction in poultry, A. E. SCHUMACHER and G. F. HEUSER. (Cornell Univ.). (*Poultry Sci., 18 (1939), No. 5, pp. 369–374, figs. 2*).—Further evidence (E. S. R., 79, p. 94) regarding the important role of riboflavin in reproduction in poultry is reported. Hatchability was influenced within a very short time by changes in the riboflavin content of the ration. Riboflavin injection of hens or eggs did not affect hatchability, indicating that riboflavin may not be utilized as such.

The effect of supplementary heat on egg production, feed consumption, amount of litter required, and net flock income, II, C. E. LEE, S. W. HAMILTON, L. HENRY, and M. E. CALLAHAN (*Poultry Sci., 18 (1939), No. 5, pp. 359–368*).—In a further report of this investigation (E. S. R., 78, p. 235), 2 years' results indicated that the use of supplementary heat in the laying house under the conditions previously described has resulted in a lower egg production, slightly lower feed consumption, occasionally a lower litter requirement, and a serious and consistent lowering of the net flock income. The use of artificial heat did not cause a decrease in average egg weight.

The relation of winter production to subsequent mortality from various causes, I. M. LERNER, L. W. TAYLOR, and R. E. LUBBEHUSEN. (Univ. Calif.). (*Poultry Sci., 18 (1939), No. 6, pp. 457–463, fig. 1*).—The records of White Leghorn pullet flocks, representing a number of sire families and secured over 3 successive years, were analyzed in this study. The degree of correlation between egg production from the first egg to the last day of February and subsequent mortality occurring between March 1 and September 30 was determined. Production and subsequent pathological lesions were found to be negatively associated, with evidence that within each sire's progeny the birds with lower production records were more likely to die during the first laying year than those with higher records. However, the question as to whether or not the negative association was due to common causality or actually one of the two conditions studied is the effect of the other cannot be answered from these data. It is further pointed out that families with lower winter production records will not necessarily have a higher incidence of pathology than families with higher records, this holding true for neoplastic pathology, pathology of the reproductive system, and grouped pathology of other types.

The formation of erosions of the gizzard lining in the young chick, A. I. LANSING, D. MILLER, and H. W. TITUS. (U. S. D. A.). (*Poultry Sci., 18 (1939), No. 6, pp. 475–480, figs. 7*).—Findings revealed by gross examinations of a large number of gizzards from chicks ranging from a few hours to a few weeks in age and by a detailed microscopic examination of a number of normal and abnormal gizzards are described. Approximately 75 percent of the gizzards examined were not normal, and of the abnormal ones about 45 percent exhibited the condition commonly described as gizzard erosion. It is concluded that hemorrhages from the glandular layer, but originating from the capillaries in the submucosa, are the immediate cause of gizzard erosions.

Relative effectiveness of ingested and injected manganese in preventing perosis, C. D. CASKEY, and L. C. NORRIS. (Cornell Univ.). (*Soc. Expt. Biol.

and Med. Proc., 40 (1939), No. 4, pp. 590–593).—In the experiments described groups of chicks fed a basal diet containing 1 and 0.5 percent of calcium and phosphorus, respectively, and others a basal diet containing 3 and 1.5 percent of calcium and phosphorus, respectively, received graded levels of manganese in the ration. Comparable lots received intraperitoneal injections of isotonic solutions of manganese chloride-sodium chloride. At the lower level of calcium and phosphorus feeding, 2.5 mg. of manganese per 100 gm. of diet completely protected against perosis, while with the higher level of calcium and phosphorus intake even 14 mg. did not entirely prevent this disorder. Thus it is evident that excess calcium and phosphorus in the diet greatly reduced the availability of manganese in the intestinal tract. Chicks receiving the higher level of calcium and phosphorus were entirely protected against perosis with the injection of as little as 10 mg. of magnesium over a period of 6 weeks.

The interrelationship of physical measurements of eggs and their effect upon hatchability, W. J. Rudy and D. R. Marble. (Pa. Expt. Sta.). (*Poultry Sci., 18 (1939), No. 5, pp. 354–358*).—Factors included in this statistical study were percentage hatchability, egg weight, yolk weight, albumen score, cohesive quality of albumen, height of firm albumen, percentage of firm albumen, and shell weight. Hatchability showed a low though significant negative correlation to egg weight. Only 1 of the 10 correlations made between hatchability and quality of the firm albumen was significant, and even this value proved insignificant during a second year. Significant correlations were obtained between the 4 measures of firm albumen, indicating that these measurements are expressions of the same physical properties of the egg.

Fertility study of fresh eggs by radio frequency conductivity and dielectric effect, A. L. Romanoff and C. L. Cottrell. (Cornell Univ.). (*Soc. Expt. Biol. and Med. Proc., 42 (1939), No. 1, pp. 298–301, fig. 1*).—A radio-frequency circuit consisting of a variable condenser, inductance coil, and thermoammeter and driven by a 5 w. generator at frequencies ranging from 14 to 14.4 mc. was employed in these studies. A comparison of nine groups of eggs indicated that infertile ones generally showed greater conductivity and lower dielectric constant than fertile ones. Other data are presented on the influence of egg weight, shape, and proportional amounts of contents and of replaced egg contents on energy absorption and resonance in radio-frequency circuit.

Factors involved in the microbic invasion of hen's eggs, A. W. Turner and L. Arnold. (Univ. Ill. et al.). (*U. S. Egg and Poultry Mag., 45 (1939), No. 10, pp. 599–601, 626–628, 630, 632, 634, 635*).—A review and interpretation of scientific knowledge bearing on the natural sanitary characters of eggs. Forty-six references are cited.

Egg quality: A literature review, L. A. Wilhelm. (Wash. State Col.). (*U. S. Egg and Poultry Mag., 45 (1939), Nos. 9, pp. 565–570, 572, 573; 10, pp. 588–594, 619–624; 11, pp. 675–679, 687–694*).—A comprehensive review, with a bibliography of 318 references.

Riboflavin requirements of ducklings, J. C. Fritz, W. Archer, and D. Barker (*Poultry Sci., 18 (1939), No. 6, pp. 449–454*).—In two series of experiments, using both normal and purified basal diets, it was found that not less than 300γ of riboflavin per 100 gm. of feed is required for the optimum growth of ducklings during the first few weeks of life, indicating that chicks and ducklings have a similar requirement for this factor. A type of leg deformity developed in ducklings receiving the purified diets, suggesting that this species requires a factor or factors not needed by chicks. Fishy flavor and odor in the meat was corrected by eliminating cod-liver oil and fish meal from the diet for a few days before the birds were dressed.

A humane method of killing foxes, C. F. BASSETT (*Amer. Fur Breeder, 12 (1939), No. 5, pp. 28, 29, fig. 1*).—A simple apparatus and procedure for electrocuting foxes are described.

DAIRY FARMING—DAIRYING

Dairy cattle and milk production, C. H. ECKLES, rev. by E. L. ANTHONY and L. S. PALMER (*New York: Macmillan Co., 1939, 3. ed., rev., pp. XV+520, [pl. 1], figs. 101*).—The third edition (E. S. R., 50, p. 577) of this popular textbook, while retaining the plan and style of earlier editions, has been completely revised and rewritten where new material and new topics seemed desirable.

[Experiments with dairy cattle and dairy products in Oregon] (*Oregon Sta. Bul. 359 (1938), pp. 26, 54–58, 59, 60, figs. 4*).—Results are briefly noted for the following investigations: The value of alfalfa hay for dairy cows when fed as a sole ration or in combination with grain and the amino acid deficiency of alfalfa protein, the effectiveness of pastures for dairy cattle, silage crops and ensiling methods, the role of iodine in dairy cattle nutrition, the yield and feed value of various root crops, improving forage crop yields through tidewater irrigation, the effect of certain mineral and vitamin deficiencies on fertility in dairy cattle, and causes of crumbliness and stickiness of butter.

[Experiments with dairy cattle and dairy products in Pennsylvania] (*Pennsylvania Sta. Bul. 382 (1939), pp. 38–41, 42*).—Reports of studies with dairy cattle include: Input as related to output in milk production, by A. A. Borland; the effect of various environmental and management factors on milk yields, by A. L. Beam; the effect of adding mineral supplements to dairy rations when good-quality roughage is fed, and the preparation and use of legume silage, both by S. I. Bechdel; and the effect of various fertilizer treatments on returns from dairy pastures, by Bechdel and C. F. Noll.

From studies with dairy products, results are noted on factors affecting the efficiency of homogenization of milk, and quality tests for receiving milk, both by F. J. Doan; flavor defects in milk, by C. D. Dahle; the role of lactic acid in curing cheese, by Dahle and T. G. Anderson; bacterial changes in milk under refrigeration, by Anderson; and the influence of various feeds on the color of milk, by W. D. Swope.

[Investigations with dairy cattle and dairy products in Vermont] (*Vermont Sta. Bul. 452 (1939), pp. 15–20*).—Progress reports (E. S. R., 80, p. 244) are presented for the following investigations: The calcium and phosphorus requirements of dairy cows; the effects of feeding vitamins A and D in concentrated cod-liver oil with different grades of hay to dairy calves; the conservation of nutrients in grasses and legumes by ensiling, artificial drying, and natural curing; the dissolved oxygen content of milk as related to the reduction tests; the relation of bacteria and of oxygen to the flavor of milk susceptible to becoming oxidized; factors affecting the accuracy of the Babcock test; factors affecting the body of market cream; and impregnation of cows by artificial methods.

Roughage quality and quantity in the dairy ration: A review, C. F. HUFFMAN. (Mich. Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 11, pp. 889–980*).—This is a comprehensive review covering roughage consumption, chemical composition and feeding value, preservation, nutritive value of the protein, fat and its nutritional significance, carbohydrates and their nutritive value, minerals, vitamins, roughages as a source of vitamin D, the utilizable energy value of roughage, roughage as the sole ration and with various supplements, rules for feeding grain, and a summary. A bibliography of 565 references is included.

The value of a milk fat substitute-skim milk combination for raising bull calves for veal and heifer calves for replacements, W. E. KRAUSS, C. F. MONROE, and C. C. HAYDEN (*Ohio Sta. Spec. Cir. 57 (1939), pp. 4*).—Holstein male calves fed whole milk to 50 days of age gained 56 lb. in weight and had a dressing percentage of 56.9, while a similar lot of calves fed whole milk to 10 days of age and thereafter a commercial product, made largely from beef fat, mixed with skim milk gained 44 lb. over a like period and had a dressing percentage of 55.6. The latter group showed a decided advantage in cost of raising and were adjudged as satisfactory veal calves. A high percentage of calves receiving the milk substitute without additional vitamin A succumbed to pneumonia. The addition of a vitamin A supplement to this diet practically eliminated this trouble. The plan of milk-substitute feeding also gave satisfactory results with Holstein heifer calves.

The nutritive value of proteins for milk production.—V, The effect of high temperature and of season on the nutritive value of grass proteins, the supplementary effect of the maintenance ration on the production ration, and the effect of feeding a high-protein ration, S. MORRIS and S. C. RAY (*Jour. Dairy Res. [London], 10 (1939), No. 2, pp. 165–185, figs. 11*).—Continuing this series (E. S. R., 76, p. 382), artificially dried spring grass (dried either at 280° or 350° F.), artificially dried autumn grass, and linseed meal were alternately included in the production ration of milking cows, while the maintenance ration of straw, beet pulp, and oats was held constant. The biological value of the protein in spring grass was unaffected by the temperature of drying even to the extent of scorching the grass. The autumn grass was lower in biological value than spring grass, and linseed meal ranked very low in this regard.

In a second experiment, in which hay and straw were alternately fed (at equivalent protein levels) as a supplement to both high- and low-protein rations, the hay exerted a marked supplementary effect on the biological value of the total protein, indicating that a certain mixture of amino acids is essential before maximum milk production can be obtained. The nitrogen balance, fecal nitrogen excretion, and urinary partition of nitrogen on various rations are described. High-temperature drying appeared to affect the nature of sulfur compounds in the grass, with a consequent diminution in the retention.

The flavor of milk as affected by season, age, and the level of feeding of dairy cows, J. C. HENING and A. C. DAHLBERG. (N. Y. State Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 11, pp. 883–888, fig. 1*).—Milk samples were obtained from six groups of cows fed at levels ranging from 20 percent below to 30 percent above the Morrison Standard level. The flavor of the fresh milk and its keeping quality, as indicated by the occurrence of oxidized flavor and the numerical score after 3 days, was not influenced by the level of feeding. The occurrence of oxidized flavor was considerably less in summer than in winter months. A trend toward a decrease in the incidence of oxidized flavor with increasing age of the cows was also observed.

Improvement in the viscosity of pasteurized cream through subsequent heat treatment, H. F. WIESE, J. H. NAIR, and R. S. FLEMING (*Jour. Dairy Sci., 22 (1939), No. 11, pp. 875–881*).—In an effort to determine which of the cream constituents is involved in the process whereby the viscosity of cream is improved by alternately warming and cooling the pasteurized cream (rebodying process), a series of artificial creams was prepared by dispersing melted butterfat in an aqueous phase containing various milk solids. Butterfat from four different States was employed in the series. All of the creams were pasteurized and rebodied under uniform conditions as to rate and temperature of heating and cooling and degree of agitation. It is concluded that the fat phase of normal

foam plays the most important role in the cream rebodying process. The fat membrane material of normal milk fat globules was the most effective stabilizer for artificial creams and always resulted in a cream which would respond to the rebodying process. None of the emulsions prepared with stabilizers other than the fat globule membrane material responded to the process. The composition of the butterfat appeared to be a factor in the stability of creams subjected to this process.

The nutritional requirements of the lactic acid bacteria, J. G. DAVIS (*Jour. Dairy Res.* [*London*], *10* (*1939*), *No. 2, pp. 186–195*).—The results of experiments at the National Institute for Research in Dairying on the effect of 10 plant extracts, 3 sugars, and 3 vitamins on the growth of about 100 strains of lactic acid bacteria in milk are summarized. Sucrose proved greatly superior to maltose, but never superior to dextrose, in accelerating the growth rate of these organisms. The plant extracts used fell in the following order of ability to accelerate growth: Yeast autolyzed for 6 days, malt=beer wort, potato, alfalfa, carrot, tomato, clover, yeast autolyzed for 2 days, and bean. Normal variations in the content of vitamins B_1 and B_2 and cocarboxylase in milk did not appear to affect the rate of growth of these organisms.

The effect of serum and blood on the growth of lactic acid bacteria in milk, J. G. DAVIS (*Jour. Dairy Res.* [*London*], *10* (*1939*), *No. 2, pp. 196–201*).—The results of this investigation indicated that serum and blood do not have a marked effect on the growth of lactic acid bacteria in milk, although heated serum and, to a greater extent, heated blood generally stimulated growth. Under certain conditions unheated serum inhibited certain types of organisms, but under conditions generally encountered in practice no effect was noticeable. Hence it seemed unlikely that "slow starters" would ever be attributable to filtration of serum or constituents of the serum.

Milk-borne diseases, J. SMITH (*Jour. Dairy Res.* [*London*], *10* (*1939*), *No. 2, pp. 255–269*).—A review of recent findings on the more prevalent types of milk-borne infections, with 81 references to the literature (E. S. R., 78, p. 690).

The casein number.—A chemical method for diagnosis of mastitis, S. J. ROWLAND and M. ZEIN-EL-DINE (*Jour. Dairy Res.* [*London*], *9* (*1938*), *No. 2, pp. 174–181, fig. 1*).—Based on a study of milk samples from individual quarters of 62 cows, a close relationship was found to exist between the casein number of the milk and mastitis infection. Using a value of 78 or less as indicating an infected quarter, the chemical method of diagnosis differed from bacteriological findings in only about 8 percent of the cases, indicating that casein number may provide a valuable and reliable method for the diagnosis of mastitis.

The casein number for diagnosis of mastitis.—II, The effect of advanced lactation and of storage and preservation of the milk sample, S. J. ROWLAND and M. ZEIN-EL-DINE (*Jour. Dairy Res.* [*London*], *10* (*1939*), *No. 2, pp. 267–271*).—This study gave evidence that the casein number method of mastitis diagnosis is not applicable to cows in advanced lactation, since at this stage all quarters (either infected or uninfected) produced milk with a number below normal. Milk samples to be used for diagnosis of mastitis by the casein number method should not be held more than a few hours before analysis, since there was a pronounced decrease in casein number during storage either at low temperature or at room temperature with the addition of chemical preservatives.

Butter, C. C. TOTMAN, G. L. MCKAY, and C. LARSEN (*New York: John Wiley & Sons; London: Chapman & Hall, 1939, 4. ed., rev., pp. VII+472, figs. 134*).—In preparing this revision of Principles and Practice of Buttermaking (E. S. R., 48, p. 80) the text has been almost entirely rewritten. Three phases of the

butter industry, (1) buying and grading of cream, (2) churning—working of butter and composition control, and (3) marketing, are treated more fully than others because of their relative importance in successful plant operation.

The formation of diacetyl by starter cultures, I, II, W. J. Wiley, G. A. Cox, and H. R. Whitehead (*Jour. Council Sci. and Indus. Res. [Austral.], 12 (1939), No. 3, pp. 232-238, 239-249, figs. 7*).—Two phases of this investigation are reported.

I. *A comparison of single strain and mixed culture starters for butter manufacture.*—In a series of experiments it was found that conditions for the production of diacetyl by bacteria were more favorable in cream or milk which had been flash-pasteurized and aerated during the cooling process than similar products sterilized by steam. The desirable flavor in butter correlated well with the diacetyl content of the butter and of the cream from which it was manufactured. However, the diacetyl content of the cream did not correlate with that of the starter with which it had been inoculated. A pure culture of *Streptococcus cremoris* produced about the same amount of diacetyl at 7° C. as at 21°, although acid production was much greater at the higher temperature. On the other hand, a mixed culture containing betacocci produced about the same amount of acid at 20° as *S. cremoris* but much more diacetyl, while at 7° the betacocci had very little influence on the proportion of diacetyl produced.

II. *Rate of diacetyl production by lactic streptococci.*—In further studying the rate of diacetyl production by a pure strain of *S. cremoris* and of a mixed culture of betacocci, it was found that the former grown in milk at 21° produced diacetyl of the order of 1 p. p. m. within 24 hr., and that this proportion remained constant over a further period of 21 days. In a butter culture containing betacocci at 21° there was a rapid production of diacetyl during the period of logarithmic growth rate of the organism, reaching a peak value of the order of 10 p. p. m. However, after reaching this peak, the proportion of diacetyl fell off rapidly, about 90 percent of it being destroyed within about 12 hr. Cultures of betacocci grown in milk at 21° produced no appreciable quantities of diacetyl over a period of 100 hr., but when grown in milk acidified to pH 4.2 diacetyl was produced and destroyed similarly to that in butter cultures. Acetoin was produced and destroyed in a similar manner to diacetyl. No explanation is offered for this striking phenomenon.

Bacteriological testing of butter: New and simplified routine methods, G. M. Moir and R. R. Russell (*Jour. Dairy Res. [London], 10 (1939), No. 2, pp. 310-325, pl. 1, figs. 3*).—Methods are fully described.

Oxidation of the fat of butter during cold storage, W. J. Wiley (*Jour. Dairy Res. [London], 10 (1939), No. 2, pp. 300-309*).—This series of studies at the Dairy Research Institute, New Zealand, gave evidence that either ripened pasteurized cream or unripened raw cream contained a fat-oxidizing enzyme which was most active at a pH of about 5 and a high salt concentration. The oxidation of fat in butter during cold storage as measured by the fat-aldehyde value of the fat was found to be directly related to the grade of the butter after storage. Acidity, starter organisms, salt, and low-pasteurization temperatures each favored the oxidation, but neither diacetyl nor acetoin influenced it.

The relation of certain lactic acid bacteria to open texture in Cheddar cheese, I. R. Sherwood (*Jour. Dairy Res. [London], 10 (1939), No. 2, pp. 326-335*).—Evidence secured in this study at the Dairy Research Institute, New Zealand, indicated that slit openness in Cheddar cheese is associated with the production of gas within the cheese. The flora of the open cheese was found to include a larger proportion of gas-producing types of lactic acid bacteria than did the flora of close cheese. The addition of such organisms to cheese milk resulted in the development of slit openness in the cheese.

A simple and accurate viscosimetric form of rennet test, C. W. KING and M. MELVILLE (*Jour. Dairy Res.* [*London*], *10* (*1939*), *No. 2, pp. 340–354, figs. 8*).—A viscosity type of rennet test is described, and results from its use are reported.

The assessment of curd firmness prior to cutting, F. M. V. COPPEN (*Jour. Dairy Res.* [*London*], *10* (*1939*), *No. 2, pp. 336–339, figs. 2*).—Using the Scott Blair apparatus (E. S. R., 81, p. 102), a study was made of the moduli of Cheddar, Cheshire, Double Gloucester, and Derby curds during a period of 1 yr. The mean firmness of normal Cheshire and Double Gloucester curds was found to be the same as that of normal Cheddar curds. Normal curds, regardless of type, were softer in the summer months than in winter. In the opinion of the author, the smallest difference in modulus which can be correctly appreciated is of the order of 8 percent.

Bacterial spoilage of processed cheese, M. J. GRIFFITHS (*Queensland Agr. Jour., 52* (*1939*), *No. 2, pp. 186–191, figs. 3*).—A defect in processed cheese characterized by bleaching and tainted flavor has been investigated. The responsible organism has been isolated, and its cultural and biochemical properties are described. It is a strictly anaerobic sporing bacillus which closely resembles *Clostridium coagulans*. The source of infection was not found, but is probably attributable to the use of milk of poor hygienic quality in cheese making.

The effect of commercial drying and evaporation on the nutritive properties of milk, K. M. HENRY, J. HOUSTON, S. K. KON, and L. W. OSBORNE (*Jour. Dairy Res.* [*London*], *10* (*1939*), *No. 2, pp. 272–293, fig. 1*).—Spray-dried, roller-dried, and evaporated milks, prepared commercially from one batch of raw milk, were compared in a series of experiments at the National Institute for Research in Dairying. No difference was found in the biological values of the proteins of these processed milks, but the proteins of the evaporated milk were significantly lower in true digestibility than those of the spray-dried milk and those of the roller-dried milk were intermediate. Reconstituted milks from these three sources, supplemented with minerals and fed ad libitum to litter-mate rats, produced practically identical gains in weight, but on the basis of gain per unit of milk consumed the dried milks were significantly superior to the evaporated milk. The vitamin B_1 content of the evaporated milk was only about one-half that of the dried samples. None of the processes reduced the carotene, vitamin A, or riboflavin content of the milk, nor did these factors decrease during prolonged storage. Spray drying caused a 20-percent and roller drying and evaporated each a 30-percent loss in the original vitamin C content of the milk. Loss of vitamin C during storage was negligible in the roller-dried lot, slightly greater in the spray-dried lot, and still greater in the evaporated milk.

The rapid determination of peroxide values for the fat in milk powders, E. A. B. SMITH (*Jour. Dairy Res.* [*London*], *10* (*1939*), *No. 2, pp. 294–299*).—The described method consists briefly in dissolving a weighed sample of milk powder in glacial acetic acid, adding chloroform, and filtering. A given amount of potassium iodide solution is then added to an aliquot of the filtrate, this mixture being diluted with water and titrated with standard sodium thiosulfate. Estimation of the peroxide values by this method is only about 90 percent of the true value, but in cases where relative rather than absolute values will serve, this method is useful because of the rapidity and ease of manipulation.

Bacteriological studies of spray-dried milk powder, A. A. NICHOLS (*Jour. Dairy Res.* [*London*], *10* (*1939*), *No. 2, pp. 202–230, figs. 3*).—In an extensive study at the Hannah Dairy Research Institute covering the examination of over 400 samples of spray-dried milk powders, the average arithmetic "weighted"

means of plate counts and methylene blue reduction tests at 37° C. on the reconstituted milks were found to be 4,363,000 per gram of powder and 8.1 hr., respectively, with a wide spread of values for each test. About 10 percent of the samples gave positive presumptive coliform tests. The predominating flora of the reconstituted milks at 37° rendered it acid in reaction and clotted it; over 97 percent of the pure cultures from such samples were found to be heat-resistant streptococci. The methylene blue reduction test gave reasonable agreement with plate counts at 37° provided the correct regression equation was used.

Bacteriological studies of canned milk products, A. A. Nichols (*Jour. Dairy Res.* [*London*], *10* (*1939*), *No. 2, pp. 231–249*).—Samples of evaporated milk and canned cream from three factories as well as a large number of samples from general sources were examined to determine to what extent nonsterility of these products occurred in commercial practice. All of those samples obtained from general sources were found to be sterile. Of the defective factory samples examined, "blowts" in evaporated milk and thin, bitter, and putrid cream were the main causes of spoilage encountered. Strains of *Escherichia* were the most common producers of gassy spoilage. Of the heat-resistant sporeformers isolated from both sound and defective samples, practically all were aerobic in type, a large percentage being strains of *B*[*acillus*] *subtilis* or *B. licheniformis*. The methods employed in these studies are fully described.

VETERINARY MEDICINE

Handbook of virus diseases, I, II, edited by E. Gildemeister, E. Haagen, and O. Waldmann (*Handbuch der Viruskrankheiten. Jena: Gustav Fischer, 1939, vols. 1, pp.* [*XI*]+*652, pls.* [*7*], *figs.* [*63*]; *2, pp. IV*+*768,* [*pls. 2*], *figs.* [*105*]).—Volume 1 of this work is devoted to a general discussion (pp. 1–256) and a special part in which febrile diseases, including pustular, vesicular, exanthematous, and septicemic affections, respectively, are dealt with. Volume 2 deals with the localized virus diseases of man and the domestic animals (pp. 1–457), virus diseases of cold-blooded animals, insects, and plants, virus as related to tumors, virus-resembling diseases, and animal diseases of which a virus etiology remains to be determined.

Virus and virus diseases of men, animals, and plants, G. Seiffert (*Virus and Viruskrankheiten bei Menschen, Tieren und Pflanzen. Dresden and Leipzig: Theodor Steinkopff, 1938, pp. XI*+*221, figs. 7*).—This introduction to the subject is presented in general (pp. 1–66) and special (pp. 67–216) parts, accompanied by numerous references to the literature.

Some studies on slow-lactose-fermenting bacteria, L. D. Bushnell. (Kans. State Col.). (*Jour. Bact., 38* (*1939*), *No. 2, p. 234*).—Numerous organisms considered to be paracolon bacilli were isolated by the author during the study of certain paratyphoid infections in chickens in Kansas. It was not possible to correlate the presence of the paracolon group in the intestine of the chicken with any particular type of disease, but they seem to appear most frequently in certain flocks. The reason for their appearance under the conditions described is not known.

Biological assay of feeding stuffs in a basal ration for coccidium-growth-promoting substance, I–III. (Iowa State Col.). (*Iowa State Col. Jour. Sci., 11* (*1937*), *No. 3, pp. 311–322; 12* (*1938*), *No. 2, pp. 211–215; 13* (*1939*), *No. 3, pp. 243–247*).—Part 1 of this biological assay deals with procedure, yellow corn meal, oats, oat hulls, wheat, linseed meal, and meat scrap, and part 2 with barley, rye, wheat bran, wheat flour middlings, and soybean meal, both by E. R. Becker and R. C. Derbyshire. Part 3, dealing with dried fish meal, alfalfa meal, and white wheat flour, is by E. R. Becker and P. C. Waters.

Observations on the bionomics of ova and miracidia of Fasciola hepatica Linn. in eastern Canada, H. J. GRIFFITHS (*Canad. Jour. Res., 17 (1939), No. 10, Sect. D, pp. 205–211*).—The effect of temperature, light, darkness, and chemicals on the hatching of the eggs of the liver fluke *F. hepatica* is considered. The methods employed for attempted infestation of suspected snails are described. In no instance were any specimens of the 11 species of snails exposed proved to act as intermediate host for this fluke.

Tick-borne diseases, W. O. NEITZ and P. J. DU TOIT (*Jour. So. African Vet. Med. Assoc., 9 (1938), No. 3, pp. 85–124*).—This contribution includes a classified list of references to tick-borne diseases (pp. 100–108), a tabulated list of such diseases, including the animals affected, cause, country, transmitter, and number of hosts (pp. 109–118), and a classified host index, including host, tick, and parasite species (pp. 119–122). A table is also given of the tick-transmitted diseases, with their incubation periods, when naturally and artificially transmitted (pp. 122–124).

Progress of spirochaete infection in the developmental stages of the host tick, Ornithodoros hermsi Wheeler, C. M. WHEELER. (Univ. Calif.). (*Amer. Jour. Trop. Med., 18 (1938), No. 4, pp. 413–419, figs. 3*).—The series of experiments reported has demonstrated "(1) that hereditary transmission of spirochetes of California relapsing fever was effected through a small percentage, 0.25 percent, of the progeny of infective female ticks; (2) that from 35 percent to 48 percent of noninfective ticks when allowed to feed as larvae on infected laboratory white mice were able to acquire the spirochetes and transmit them to normal animals in some one or all of the subsequent developmental stages; and (3) that clean larval ticks produced by a female tick taken at Lake Tahoe were able to acquire the relapsing fever spirochetes from a white mouse previously infected through the bite of an infected tick taken at Big Bear Lake, some 400 miles distant, and were able to transmit these spirochetes to clean white mice."

Serological investigation of Drosophila antigens using the precipitation reaction, S. HABERMAN and R. W. CUMLEY (*Jour. N. Y. Ent. Soc., 47 (1939), No. 3, pp. 219–226*).—Report is made of the use of the precipitation reaction to show differences in the antigens of various *Drosophila* species. "The values obtained by the precipitin test did not correspond exactly with those obtained by the complement-fixation reaction, probably due to factors inherent in the two different technics or to errors in performing the tests. Reciprocal antigen-antibody relationships may or may not be found, depending upon whether the antigenic components of the various species are shared in equal proportions."

[**Work in animal pathology by the Oregon Station**]. (Partly coop. U. S. D. A.). (*Oregon Sta. Bul. 359 (1938), pp. 10, 26–28, 59, 86, 87, figs. 7*).—The work of the biennium 1937–38 (E. S. R., 78, p. 847) briefly reported upon includes the isolation of causative organisms of four livestock diseases (stiff lambs, black disease, lunger disease, and the so-called Curry County sudden death disease), fern poisoning in cattle, control of liver flukes and lungworms in sheep and goats, Bang's disease testing and reinfection, and turkey diseases.

The importance of artificial insemination in combating infectious diseases, T. M. OLBRYCHT (*18. Internatl. Cong. Agr., Dresden, 1939, Sect. 6, Main Rpts., pp. 25–34, figs. 4*).

The latest experiences in the combating of foot-and-mouth disease, MÜSSEMEIER (*18. Internatl. Cong. Agr., Dresden, 1939, Sect. 6, Main Rpts., pp. 5–10*).

The effects of sulfanilamide on the lower vertebrates, J. T. LITCHFIELD, JR. (*Jour. Pharmacol. and Expt. Ther., 67 (1939), No. 2, pp. 212–223, fig. 1*).—In a study made of its effects on the lower vertebrates, including the fish, frog, and

chicken, sulfanilamide was found to be most toxic for the fish and least toxic for the frog, on the basis of blood concentrations. "Absorption of sulfanilamide was found to vary, depending on the route of administration. Excretion of sulfanilamide in the lower vertebrates was slow, corresponding to the small amount of glomerular filtrate in these animals. Conjugation of sulfanilamide occurred in the fish and chicken but not in the frog. Cyanosis was readily produced in the chicken by chronic intoxication with sulfanilamide. Direct toxic action of sulfanilamide on the muscle of the frog was found. This was reproduced in vitro on isolated frog muscle. With the exception of the fish, toxicity could only be demonstrated with blood levels of drug above the concentrations used therapeutically in man."

Colorado's poisonous and injurious plants, L. W. Durrell and I. E. Newsom (*Colorado Sta. Bul. 455* (1939), pp. 71, figs. 92).—This is a revision of Bulletin 429 (E. S. R., 76, p. 97) which includes additional material.

Toxic algae in Colorado, A. W. Deem and F. Thorp, Jr. (Colo. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 95 (1939), No. 752, pp. 542–544, fig. 1).—This is a more detailed account of the investigation previously noted (E. S. R., 82, p. 254).

Studies on the so-called corn stalk poisoning in cattle, L. H. Schwarte, D. F. Eveleth, and H. E. Biester. (Iowa State Col.). (*Vet. Med.*, 34 (1939), No. 11, pp. 648–651).

Mummification of the bovine fetus associated with Bang's disease, C. R. Donham and B. H. Edgington. (Ohio Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 95 (1939), No. 752, pp. 637, 638, fig. 1).

Brucella abortus and its agglutinin in the colostrum and milk of cows vaccinated with U. S. B. A. I. Brucella strain 19, L. H. Scrivner. (Wyo. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 95 (1939), No. 752, p. 640).—It is concluded that the vaccination of first-calf heifers during their calfhood with U. S. Department of Agriculture *Brucella* strain 19, living culture vaccine, prevented permanent infection of the udder to the extent that *B. abortus* could not be recovered after 11 days postpartum. In only one of the 28 cows vaccinated at 4 to 6 mo. of age could *Brucella* agglutinin be demonstrated in the milk 3 to 26 days following parturition.

Listerella from a premature bovine fetus, R. Graham, H. R. Hester, and N. D. Levine. (Univ. Ill.). (*Science*, 90 (1939), No. 2336, pp. 336, 337).—Record is made of the isolation of a *Listerella* from a 7-month-old fetus from a Bang's disease-free herd in Illinois. A heifer that proved negative to the agglutination test aborted 10 days following intravenous inoculation of the *Listerella* culture. From the aborted fetus, *Listerella* was regained in pure and abundant culture from the brain stem, cerebrum, heart blood, thymus gland, and bone marrow.

"Falling disease" of cattle in the south-west of Western Australia, H. W. Bennetts and H. T. B. Hall (*Austral. Vet. Jour.*, 15 (1939), No. 4, pp. 152–159).—A description is given of a disease of dairy cattle, known locally as falling disease, which is characterized by an enzootic distribution, by a seasonal incidence, and by sudden death almost invariably without premonitory signs. A characteristic glomerulonephritis and marked hemosiderosis are regarded as being pathognomonic of the disease. The most striking and constant lesions are congestion of the abomasum and small intestine, congestion and petechiation of the trachea, a very friable liver, and a large dark pulpy spleen. The possible relationship of the anemia, mineral deficiency, and a high clover ration to falling disease is under investigation.

The use of brilliant green, sodium azide, and dextrose in the microscopic and Hotis tests for streptococcic mastitis, C. S. Bryan, E. D. Devereux, W. C.

[Hastings?] and A. C. CORBETT. (Mich. Expt. Sta.). (*North Amer. Vet., 20 (1939), No. 9, pp. 41-46*).—The use of a selective preservative yielding a final dilution of 1:50,000 brilliant green, 1:15,000 of sodium azide, and 1:1,000 of dextrose in the milk increased the accuracy of results of the microscopic test as compared to the use of brilliant green alone as the preservative, and greatly reduced the time required to read the results by suppressing both the udder streptococci and contaminating bacteria. "The use of the same selective preservative in the Hotis test increased the 24-hr. reading from 60 percent efficiency to 8[?] percent efficiency and reduced the number of negative cows giving positive results from 7.3 percent to 2.6 percent. The 48-hr. reading increased the efficiency of the testing of infected cows from 68 percent for the regular Hotis test to 87.6 percent, and reduced the number of negative cows giving positive reactions from 14.6 percent for the regular Hotis test to 4.6 percent."

Sulfanilamide: Pioneering in mastitis work, O. ERF. (Ohio State Univ.). (*Jersey Bul., 1939, Oct. 4, pp. 1516, 1549-1551*).—Report is made of experimental work conducted in an attempt to control mastitis and improve the milk supply in Columbus, Youngstown, and other cities of Ohio. "Sulfanilamide has been found to be of great value and especially in large herds for cows that suddenly develop inflammation in one or more quarters, and it has been of infinite value for small herds in which mastitis appears quite frequently. In no case have we found that sulfanilamide has been injurious to the animal even though the long-chain and short-chain streptococcus have been present. . . . In all of our investigational work, we have seen only one cow that has been sensitive to the drug. It is not to be construed that the feeding of sulfanilamide acts as a permanent cure. It does materially reduce the number of cases of acute mastitis after a month or two. In many cases, a higher rate of milk production occurs after feeding sulfanilamide than before sulfanilamide was given. Immediately after it is fed the milk production always seems to go down, but after the effect is over the milk production increases. However, long-chain streptococcus may remain in the milk. The feeding of sulfanilamide has not eliminated these infections permanently. Neither does it alter the particular nutritional factor of the milk."

An experimental study of homologous hyperimmune serum in the prevention of acute dysentery of newborn calves, J. W. DOLLAHITE. (U. S. D. A.). (*Vet. Med., 34 (1939), No. 11, pp. 652-654*).—A detailed account of an investigation an abstract of which has been noted (E. S. R., 81, p. 842). The work led to the conclusion that homologous hyperimmune serum will prevent heavy losses from the disease in newborn calves if given as a prophylactic soon after birth, but probably has little or no value as a therapeutic agent.

A summary of 700 autopsies on sheep and lambs, L. B. SCHOLL. (Mich. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 6, pp. 663, 664*).

Food intoxications in sheep, L. B. SHOLL. (Mich. Expt. Sta.). (*Jour. Amer. Vet Med. Assoc., 95 (1939), No. 752, pp. 642, 643*).

Black disease (infectious necrotic hepatitis of Oregon sheep), J. N. SHAW, O. H. MUTH, and L. SEGHETTI (*Oregon Sta. Bul. 360 (1939), pp. 18, figs. 7*).—A hitherto mysterious widespread disease of Oregon sheep appearing on so-called fluky pastures largely in Douglas, Lane, Benton, Linn, and Marion Counties has been proved to be due to the anaerobic bacterium *Clostridium novyi* B (*Bacterium oedematiens*), first identified by Turner and Davesne (E. S. R., 59, p. 174). This organism, first isolated in New South Wales by Dodd (E. S. R., 45, p. 685) and first recognized in the United States in Montana by H. Marsh,[1] causes the disease by its invasion of fluke-damaged livers, result-

[1] 12. Internal. Vet. Cong., New York, N. Y., 1934, [Rpt.], vol. 2, p. 217.

ing in the liberation of a lethal toxin. Some of the symptoms and lesions are similar to, and are sometimes confused with, so-called hemorrhagic septicemia. Treatment with 1 cc. doses of carbon tetrachloride or flukoid does not stop losses, but the application of copper sulfate to fluke-infested pastures will assist in preventing its occurrence. No satisfactory method of treatment has as yet been discovered. A list is given of 22 references to the literature.

Helminths from hill sheep, D. ROBERTSON (*Scot. Jour. Agr., 22 (1939), No. 3, pp. 231–235*).—In the investigations reported a total of 14 species of helminths (12 species of nematodes and 2 species of cestodes) were found infesting the intestinal tract and mesenteries of hill lambs in Scotland. All of the lambs examined were infested with *Haemonchus contortus*, *Ostertagia circumcincta*, and *Nematodirus* spp., and all of the ewes with *Bunostomum trigonocephalum*.

A preliminary note on the chemotherapy of oesophagostomiasis of sheep, with special reference to the efficiency of phenothiazine, H. McL. GORDON (*Jour. Council Sci. and Indus. Res. [Austral.], 12 (1939), No. 3, pp. 203–206*).—The preliminary experimental work reported is said to indicate that phenothiazine offers great promise for the successful treatment of oesophagostomiasis of sheep (*Oesophagostomum columbianum*) by drenching, and that satisfactory results may be obtained without the necessity for insuring that the drug passes direct to the abomasum if a large enough dose be given.

A preliminary note on the anthelmintic efficiency of phenothiazine against Haemonchus contortus in sheep, H. McL. GORDON and L. K. WHITTEN (*Jour. Council Sci. and Indus. Res. [Austral.], 12 (1939), No. 3, p. 207*).—During the course of the experimental work above noted phenothiazine was found to be very effective against *H. contortus* as well as *Oesophagostomum columbianum*. In further tests doses of from 0.3 to 0.75 gm. per kilogram of body weight, repeated on 3 successive days, were 100 percent efficient in all of seven sheep. In several sheep the egg counts were markedly reduced within 24 hr. of the initial treatment, suggesting that even a single dose may possess a high degree of efficiency. There was a sufficient concentration of phenothiazine in the feces to destroy the developing preinfective larvae. There is evidence to suggest that at higher concentrations phenothiazine is lethal to the infective, third stage, inshcathed larvae.

The blood picture in hog cholera, H. C. H. KERNKAMP. (Minn. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. 752, pp. 525–529*).—Studies of the blood of a relatively large number of swine have shown that in hog cholera the picture is characteristic of a severe leucopenia, and the occurrence of leucopenia in three or more pigs in a herd in which swine are sick constitutes a most vital aid to a diagnosis of that disease. Leucocyte counts of 8,000 cells per cubic millimeter or less are indicative of a decrease below the normal. In this disease there is no significant change in the number of red blood cells or in the amounts of hemoglobin per unit volume of blood.

The relation of nicotinic acid to necrotic enteritis in swine, G. K. DAVIS and V. A. FREEMAN. (Mich. State Col.). (*Amer. Chem. Soc. Mtg., 97 (1939), Abs. Papers, p. 11B*).—Brief reference is made to observations of 125 experimental animals, the work having shown that cases of necrotic enteritis in swine may be prevented or cured by feeding supplements of liver, yeast, and nicotinic acid.

Toxicity of potassium cyanide for swine, J. F. COUCH and H. BUNYEA. (U. S. D. A.). (*Vet. Med., 34 (1939), No. 10, pp. 620–623*).—In tests conducted with a view to securing accurate information on the toxicity of cyanide for the pig, the details of which are reported in tables, this animal was found to be somewhat more resistant than cattle and sheep, previously studied (E. S. R.,

74, p. 103). "The minimal lethal dose when there is no emesis ranges from 2.4 to 3.4 mg. per kilogram calculated as hydrocyanic acid and administered as potassium cyanide. In 59 percent of the cases the animals vomited part of the dose. Eight survived much higher doses than the above. Toxic effects were obtained with a dose of 0.65 mg. per kilogram and severe symptoms with doses of 0.86 to 1.9 mg. per kilogram. The smallest emetic dose was 0.84.

"The symptoms observed were similar to those seen in cattle and sheep but were much delayed. Pigs appear to be much more slowly affected than ruminants. This fact, combined with the ease with which the pigs can empty the stomach, probably accounts for the relative immunity of the hog to spontaneous poisoning from cyanogenetic plants. There was no indication of the establishment of tolerance or of increased susceptibility."

Parasites and parasitic diseases of the domestic equines, G. CARPENTIER (*Parasites et maladies parasitaires des équidés domestiques. Paris: Vigot Bros., 1939, pp. XII+524, figs. 242*).—The first part of this work (pp. 7–441) deals with the animal parasites and parasitic affections of equines; the second part (pp. 443–520), with their fungus parasites and mycoses.

Studies on the possible role of endoparasites in the transmission of infectious anemia, C. D. STEIN, J. T. LUCKER, O. L. OSTEEN, and W. S. GOCHENOUR (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. 752, pp. 536–541*).—The authors have found in a series of experiments involving some of the common parasites of the horse, mule, and ass that worms of the genus *Strongylus*, collected from a horse affected with infectious anemia, contained virus of this disease within their bodies, and the disease was transmitted to a normal horse through injection of a saline extract of the washed, macerated bodies of these worms. "Whether the virus was present in the tissues and body fluids of the worms, or in the ingesta within the lumen of the intestinal tract of the worms, was not determined. Injection of a similar extract of washed cylicostomes (small strongyles) collected from the same infected horse did not produce the disease in a normal horse. That the virus was completely absent from the external surfaces of the *Strongylus* worms when they were ground was indicated by the fact that a horse injected with the combined last saline washings from these worms and the cylicostomes did not acquire the disease. A normal horse injected with a similar extract of washed bots (*Gastrophilus intestinalis* and *G. nasalis*) collected from another infected horse also failed to become infected, indicating that these bots did not contain the virus of infectious anemia. A horse repeatedly fed large numbers of washed third-stage larvae of *Strongylus* and cylicostomes obtained from the feces of horses having infectious anemia did not become infected with the disease. A normal horse injected with a saline extract of large numbers of such third-stage larvae also did not become infected. These facts suggest that third-stage larvae developing from the eggs of *Strongylus* and cylicostomes harbored by infected horses do not contain the virus, but the evidence of these experiments is not regarded as an adequate basis for denial of the possibility that the larvae of these nematodes, *Strongylus* in particular, may transmit infectious anemia."

Equine encephalomyelitis in monkeys, R. W. G. WYCKOFF and W. C. TESAR (*Jour. Immunol., 37 (1939), No. 4, pp. 329–343, figs. 2*).—This is a more detailed account of experiments previously noted (E. S. R., 81, p. 576).

Studies on active and passive immunity resulting from inoculations of formolized inactivated and of active virus of equine encephalomyelitis, P. K. OLITSKY and I. M. MORGAN (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. 752, pp. 530–533, fig. 1*).—The experiments reported led to the conclusion that a formolized vaccine of equine encephalomyelitis virus, inducing a resistance that

is not brought about by any active virus which may be contained in the vaccine, is capable of reproducing the antigenicity of active virus. This was shown by the results of active immunization and of passive protection.

Multiplication of the virus of equine encephalomyelitis in surviving mosquito tissues, W. TRAGER (*Amer. Jour. Trop. Med., 18 (1938), No. 4, pp. 387–393*).—The experiments reported have shown that the virus of western strain equine encephalomyelitis multiplies in the presence of the yellow-fever mosquito tissues surviving in vitro. They also indicate that certain mosquito tissues may be more favorable for the growth of the virus than others. Further work is considered necessary before definite conclusions can be arrived at.

Differences in incidence of encephalomyelitis in horses, W. V. LAMBERT, S. R. SPEELMAN, and E. B. OSBORN. (U. S. D. A. and Mont. Expt. Sta.). (*Jour. Hered., 30 (1939), No. 8, pp. 349–352*).—A report is made of statistically significant group differences in resistance to encephalomyelitis observed in an epizootic outbreak in the stud of horses at the U. S. Range Livestock Experiment Station in 1938. "A greater percentage of horses of Nonius breeding were affected than those of other breeding. Among all yearlings 50 percent of Nonius breeding were affected, whereas only 11.1 percent of the yearlings of other breeding were affected. In the foals the corresponding percentages were 72.7 and 10.5. The differences observed were not attributable to the location of the horses on the station, their distribution being such that all groups had equal opportunity to be exposed to the disease. The data confirm previously reported observations on age differences in resistance, the younger animals being the more susceptible. No differences in resistance were observed between males and females. Possible reasons for the differences observed are discussed."

Experimental transmission of equine influenza, C. N. DALE and J. W. DOLLAHITE. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. 752, pp. 534, 535*).—Report is made of studies conducted with laboratory samples of blood taken during outbreaks in March and April 1939 from three horses infected with equine influenza. The incubation period, symptoms, and course of the disease induced by the bacteria-free serum obtained therefrom were quite typical of uncomplicated equine influenza, but the course of the disease apparently varied with the form of secondary complications. The authors were led to conclude that the samples of blood contained the virus of the disease.

Preliminary studies of distemper virus on the chorio-allantoic membrane of the developing eggs, P. J. G. PLUMMER (*Canad. Jour. Compar. Med., 3 (1939), No. 4, pp. 96–100, figs. 5*).—In the studies conducted it was found that distemper virus passed from egg to egg up to the sixth passage or generation produced focal lesions on the chorioallantoic membranes of the chick embryo. Ferrets inoculated with the virus obtained from the chick membranes at the fifth and sixth passages succumbed to typical distemper.

Poultry diseases, J. R. BEACH (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. 752, pp. 613–623*).—This report of the committee of the American Veterinary Medical Association on poultry diseases includes check lists of the virus diseases of domestic and other fowl and a bibliography of 101 titles.

Poultry mortality, L. E. BOLEY and R. GRAHAM. (Univ. Ill.). (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. 752, pp. 545–549, figs. 7*).—Report is made of the results of studies of the mortality occurring in a flock of approximately 1,500 hens and pullets over a period of 4 yr. "Sick and dead birds were autopsied daily with microscopic, histopathological, and bacteriological examinations supplementing some of the autopsies. Losses in the flock were recorded (figures=percent): 1934–35, 37.87; 1935–36, 22.2; 1936–37, 27.04; and 1937–38, 47.099. In the flock studied it appears that leukemia and internal parasites are the im-

portant factors in the mortality. The incidence of leukemia as observed at autopsy increased from 25 percent in 1934–35 to 53.1 percent in 1937–38. Seventy-eight percent of the total mortality occurred in the pullets of the flock during the year 1937–38, while 79 percent of the lesions of leukemia were observed in the pullets. A classification of the disease entities diagnosed in 15,234 poultry specimens submitted to the division of animal pathology and hygiene, University of Illinois, over a period of 7.5 yr. is recorded."

Studies on fowl pox immunization, A. B. Coronel (*Philippine Jour. Anim. Indus., 6 (1939), No. 3, pp. 239–246*).—Investigations conducted during a period of more than 3 yr., in which 709 birds were used, are reported. The stick method, using the flank as the site, was probably the best means of vaccination. The vaccination of baby chicks younger than 1 mo., especially day-old chicks, is not recommended, but chicks 1 mo. old or over in healthy stock can be vaccinated satisfactorily. "Pigeon pox vaccine did not confer solid or complete immunity to fowl pox in all the birds vaccinated. Some of them became again susceptible 2 to 3 mo. after vaccination. Thus double vaccination, that is, giving pigeon pox virus first, then fowl pox vaccine 2 to 3 mo. later, and adopting sanitary measures at the same time proved to be the most successful method of fowl pox immunization under local conditions."

Preventive vaccination against laryngo-tracheitis, T. G. Hungerford and L. Hart (*Austral. Vet. Jour., 15 (1939), No. 4, pp. 140–151*).—Report is made on the results of vaccinations conducted on approximately 10,000 birds on 13 properties with 26 separate vaccines. "Of the vaccines prepared from material from naturally infected birds in the outbreaks, eight were used in a dilution of 1 in 20 and one in 1 in 30; of those made from material from birds infected artificially with homologous strains, three were used in a dilution of 1 in 20, two in 1 in 50, and one in 1 in 100. Two were 1 in 50 dilutions of exudate from birds infected artificially with heterologous strains. All vaccines were used within a few hours of preparation. Vaccination as carried out has prevented the spread of infection to birds so treated. On occasion . . . birds may contract the disease immediately following vaccination, apparently deriving the infection from the vaccine. Vaccine such as that employed in these trials should be used the day on which it is prepared, and if prepared from natural cases, birds in the peracute stage of the disease should be selected and the exudate diluted 1 part in from 20 to 50 of glycerine saline. All birds on the property, except the infected birds, should be vaccinated, and any failing to show 'takes' on the fifth day should be revaccinated from those showing strongly positive reactions."

Possible prevention of turkey blackhead disease (*Miss. Farm Res.* [*Mississippi Sta.*], *2 (1939), No. 10, p. 7*).—Further reference (E. S. R., 81, p. 834) is made to blackhead control tests in which the use of tobacco dust in the turkey feed ration gave encouraging results. The roundworm infestation of chickens has been materially reduced by feeding 2 percent tobacco dust.

Curled tongue in young poults, C. B. Hudson. (N. J. Expt. Stas.). (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 6, p. 662, fig. 1*).—Record is made of the loss from starvation on a New Jersey poultry farm of 30 young poults in a flock of 200, caused by the curling back of the tongue. Whether the affection is congenital or acquired has not been determined.

AGRICULTURAL ENGINEERING

International directory of agricultural engineering institutions, U. Papi (*Les Institutions de génie rural dans le monde. Roma: Inst. Internatl. Agr., 1939, [5. ed.], pp. [5]+152*).—This is the fifth edition of this directory (E. S. R., 72, p. 699).

[Agricultural engineering investigations by the Oregon Station]. (Partly coop. U. S. D. A. et al.). (*Oregon Sta. Bul. 359 (1938), pp. 26, 30, 32, 80, 110–113, 114, figs. 6*).—This report notes progress in tests of small, automatically controlled feed grinders, which were found to lower the cost of feed-grinding equipment; successful trials of electric fence for the control of elk, and other electric fence experiments; work on poultry-house ventilation and litter-moisture control and effect of floor heating on management and on the commercial laying flock; water capacity of heavy and sandy soils; effect of alfalfa as a permanent cover crop on water penetration in a heavy clay soil; the "soil-moisture availabilimeter", an electrical device for the quick determination of soil-moisture availability, and forecasting of irrigation-water supply; and drainage and improvement of wet or alkaline soils.

[Agricultural engineering investigations by the Pennsylvania Station] (*Pennsylvania Sta. Bul. 382 (1939), pp. 6, 17, 18, 19, 28, 29, fig. 1*).—This report contains notes on the value and economy of properly set up electric fencing and the danger from incorrectly used electric fencing, by F. L. Bentley and J. E. Nicholas; on spring trip cultivator shanks and tractor performance, both by A. W. Clyde; on milk coolers, by Nicholas; on stalls for experimental lamb feeding, by T. B. Keith and Nicholas.

Water-application efficiencies in irrigation and soil conservation, O. W. Israelsen. (Utah Expt. Sta. and U. S. D. A.). (*Agr. Engin., 20 (1939), No. 11, pp. 423–425, figs. 4*).—Results of observations by the station of irrigation practices in Utah valleys indicate that low water-application efficiencies and resulting deep percolation losses (or lack of conservation of irrigation water) on class 1 soils (soils of valley highlands) may not cause rapid depletion of soil fertility. However, such irrigation practices on class 1 soils cause decrease in productivity of class 3 soils (soils of low-lying valley bottoms) in the same valleys by contributing to rise of the ground water and concentration of alkali. In class 1 soils the amount of water consumed is smaller than the amount of irrigation water applied. In class 2 soils (soils of medium elevation) the amount consumed is more nearly equal to the amount applied, and in class 3 soils not adequately drained the amount consumed usually exceeds the amount applied. Irrigators may contribute to water conservation by increasing water-application efficiencies on all three classes of soils, and also thus contribute especially to the conservation of class 3 soils by prevention of water logging and alkali concentration. By decreasing water-application efficiencies for periods of a few years, and thus causing large deep percolation losses in artificially drained class 3 soils, irrigators may contribute to the conservation of these soils and thus justify water losses.

Snow ridging for moisture conservation, H. F. McColly. [N. Dak. Expt. Sta.]. (*Agr. Engin., 20 (1939), No. 10, pp. 383, 384, 386, fig. 1*).—Experiments conducted at the station showed that snow ridges in fields adjacent to highways are effective in drifting the snow in the fields.

Snow should be at least 5 in. deep on the level and be fairly heavy in order to make substantial ridges. Ridging should be done in the early winter as soon as long-sustained warm periods are not likely to occur. Loose, fluffy snow does not build satisfactory ridges, as they are too likely to blow away in a strong wind. The best time to ridge the snow is when the weather is warm enough to make the snow damp. When damp snow is pushed into ridges it tends to compact and resists the wind blowing it away. Snow that is crusted due to thawing or from being compacted by the wind will form satisfactory ridges, as the firm pieces hold the loose snow in place. Stubble will often be moved into the ridge with the snow and aids in binding it together. To be certain that the snow will be collected somewhat uniformly over the area, ridges should not be more than 8 ft. apart.

Snow ridges should run across the direction of prevailing winds. However, on slightly rolling ground, the contour should be followed. Snow ridging is most successful on slightly rolling land if the contour is followed, or the land contains very heavy stubble or where rough tillage practices were used the fall before. Ridging on plowed or cultivated land is more effective than on thin stubble, grass, or bare ground.

Voids in granular materials, W. P. BERGGREN. (Calif. Expt. Sta.). (*Agr. Engin., 20 (1939), No. 6, pp. 233, 234, figs. 2*).—Abstract research in the subject which is, however, basic to the solution of practical problems in soil dynamics and the drying of grain cereals, nuts and other agricultural commodities is reported.

Laboratory tests of concretes and mortars exposed to weak acids, D. G. MILLER, P. W. MANSON, and C. F. ROGERS. (Univ. Minn.). (*Agr. Engin., 20 (1939), No. 11, pp. 427–430, figs. 10*).—Data are presented which show the relative resistance to a 0.1 N mixture of acetic and lactic acids of 26 silo staves as indicated by the accumulated quantity of material loosened by 30 daily brushings.

The very dry staves were the weakest and were least resistant to acid. The wetter mixed staves were strongest. Present specifications for concrete silo staves require that the 28-day ultimate transverse strength must average not less than 90 lb., with no test falling below 75 lb. for each inch of width of the stave. The calculated moduli of rupture for these transverse strengths are, respectively, 432 and 518 lb. per square inch. Results of the tests reported clearly show that staves which somewhat exceed these strength requirements are low in acid resistance as compared with that displayed by staves with transverse strengths of 140 lb. per inch of width.

Tests made on staves with a cement-void ratio in excess of 1.00 do not indicate greatly increased resistance to acid corrosion.

Effect of weight of tampers and numbers of tamps on the flexural strength of concrete silo staves, C. A. HUGHES, D. G. MILLER, and P. W. MANSON. (Minn. Expt. Sta., U. S. D. A., et al.). (*Jour. Amer. Concrete Inst., 11 (1939), No. 1, pp. 37–47, figs. 3*).—Tests made on 324 out of 502 concrete silo staves showed that transverse strength increased with increasing weight of the tampers from 50 to 75 lb., the increase varying with the composition of the mix. With increasing number of tamps up to 6, the strength increased again, varying with the mix when the number of tamps exceeded 6. Staves made with 2 tamps of the heavier tamper were nearly always stronger than those made with 6 tamps with the lighter tamper. With the number of tamps exceeding 6, strength first increased further (an effect attributed to further consolidation), then fell off (a result considered due to a churning effect of excessive tamping), and, with still further tamping, showed further rise and fall of the strength curves.

The three cement contents used were represented by 7, 9, and 11 staves per 94-lb. sack of cement. Aggregate gradings finer than the plant grade, the same as, and coarser than plant grade were also tested, as were mixes drier and wetter than and in accord with the plant practice in this respect.

Silo pressure and temperatures with corn and grass silage, J. R. McCALMONT and H. E. BESLEY. (U. S. D. A. and Rutgers Univ.). (*Agr. Engin., 20 (1939), No. 6, pp. 227–230, figs. 9*).—Studies of pressures exerted by corn and grass silages showed that corn silage put up in the late-milk or early-dent stage when the moisture content ranges from 68 to 72 percent exerted lateral pressures of 8 lb. and vertical pressures of 5 lb. per square foot for each foot of depth in silos of 14-ft. diameter. Corn silage in an 18-ft. silo with 74 percent average moisture exerted lateral pressures up to 14 lb. and vertical pressures of about

8 lb. per square foot per foot of depth. Grass silage put up with molasses exerted lateral pressures of 19 lb. or more and vertical pressures of from 6 to 9 lb. per square foot per foot of depth when placed in an 18-ft. silo with not more than 72 percent average moisture, or in a 12-ft. silo with not more than 80 percent moisture. Moisture content of the silage and the diameter of a silo affects the amount of later and vertical pressures.

It also was found that temperatures in low-moisture grass silage are apt to go high enough to spoil the silage unless special measures are taken to exclude the air, such as applying weights of about 40 lb. per square foot to the top of the silage.

Holding power of nailed joints, J. C. WOOLEY. (Univ. Mo.). (*Agr. Engin., 20 (1939), No. 10, pp. 385, 386, figs. 5*).—Tests of about 200 nailed joints showed that in clinching nails they should be bent in the direction of the force on the piece on which they are being clinched. If a joint is to be subjected to alternate tension and compression, the nails should be clinched at right angles to the direction of pull, or across the grain in most cases. Slightly better results were obtained when the nails were clinched away from the ends of the stock.

Data on the relative holding power of nailed joints of oak, yellow pine, and white pine showed that the oak joints not clinched averaged 1,166 lb., while the same joint clinched with the line of pull averaged 1,692 lb., an increase by clinching of 53 percent. Yellow pine, unclinched, held 706 lb., and the clinched joint held 1,086 lb. White pine showed a similar increase, the unclinched joint holding 500 lb. and the joint with the nails bent in the direction of pull holding 760 lb.

Pneumatic tractor tire profile studies, R. H. WILEMAN. [Ind. Expt. Sta.]. (*Agr. Engin., 20 (1939), No. 6, pp. 231, 232, fig. 1*).—Studies by the station of the relative efficiencies of the regular tractor tire with bar tread, the high-lug or rice-field tire, and an experimental low-profile tire on clay and black soils showed that the rubber tire must have ability to flex to conform to the soil contour, and for best results the lug height should not exceed the point where it will penetrate sufficiently to allow the body of the tire to be in contact with the soil. In disking sod ground, as in plowing, the regular tire gave the best results, the high-lug or rice-field tire being at a decided disadvantage, as its rolling resistance was much higher than for the other rubber tires although its speed of travel was slower, and the tractor had to be operated one gear slower than with the other rubber tires, or in the same gear as with steel wheels and lugs. The low-profile tire also showed lack of ability to flex and give as good contact with the soil as did the regular tire. Difficulty from excessive slippage was experienced with these tires while disking, and two or three times during the test it was necessary to straighten the disk before it could be moved. In disking cornstalk ground the regular and low-profile tires were the only ones used and showed but little difference in efficiency. This can be at least partially explained by the better tractive conditions and by the lighter drawbar load.

The data indicate that for the type of soil and field conditions encountered throughout most of Indiana, with the exception of the loose sands or muck, the conventional type of rubber tractor tire gives the best results under average farming conditions. It is concluded, however, that the rice-field or high-lug rubber tire will make it possible to use wheel-type tractors under loose, soft, and wet soil conditions where they have previously failed because of excessive slippage and miring down.

Transport wheels for agricultural machines.—I, Comparative performance of steel wheels and pneumatic tires on two manure spreaders of the same model, E. G. McKibben and H. J. Thompson. (Iowa Expt. Sta.). (*Agr. Engin., 20 (1939), No. 11, pp. 419–422, figs. 6*).—Investigations conducted at the station are reported in which the comparative performance of steel wheels and pneumatic tires on two manure spreaders of the same model were investigated from the standpoints of rolling resistance, shock, breakage, and wear. Comparative rolling resistance tests by means of a ratio dynamometer were made on 10 road and soil conditions ranging from a concrete road to a fall-plowed field thawed to a depth of 12 in. The decrease in draft resulting from the use of pneumatic tires varied from 4 to 335 lb. with a mean of 312 lb., or from 5 to 67 percent with a mean of 44 percent. The shock characteristics of these two types of transport wheels while traveling over 5 miles of gravel roads were studied by means of a contact accelerometer for the three speeds of 2.5, 5, and 10 m. p. h. The ratios of the number of shocks of a given magnitude received by the machine with steel wheels to those received by the machine with pneumatic tires averaged 4.7, 41.8, and 50.3, respectively, for the three speeds. Extreme shocks of over 10,000 lb. were recorded for the steel wheels at the highest speed. In order to compare breakage and wear, a 1,000-mile road test was run over a 5-mile course of gravel, 200, 200, and 600 miles, respectively, at 2.5, 5, and 10 m. p. h. There were no difficulties with the spreader equipped with pneumatic tires, except the loosening of a few nuts, while indications of breakage appeared on the other spreader soon after the start of the 5-m. p. h. tests.

The ratios of front axle deformation, loss of weight by front wheels, loss of weight by rear wheels, loss of weight by front-wheel bearing, and wear of front bearings were 3.4, 12.3, 14.6, 2.8, and 2.2, respectively. The annual cost of use of a set of tires for a conventional manure spreader is estimated to be about $15, or 60 ct. per day for 25 days of annual use.

Model experiments on tillage tools, K. J. DeJuhasz and A. W. Clyde. (Pa. Expt. Sta.). (*Instruments, 12 (1939), No. 5, p. 144, fig. 1*).—The authors present a tentative outline for the construction of a model testing trough (to be made from 40 to 50 ft. long, from 3 to 4 ft. wide, and about 1 ft. deep) for studies of reaction of the soil upon the tool; variation of reaction with speed, depth of cut, composition and condition of the soil, and orientation of the tool; best hitching arrangement; constructional design data; and relative tillage efficiency of tools and effects of variations in setting. The essential mechanism is to consist of a reference frame moved accurately along the trough on wheels or skids by a motor and rope drum or by a hydraulic cylinder and pulley system, and provided with recording instruments, motion-picture equipment for recording soil motion, and an observer's seat; together with a subframe carrying the tool and arranged for slight displacement, with respect to the reference frame, in 6° of freedom with measurement of the corresponding force components acting on the tool.

The probability of a scale effect, due to the fact that the size of the soil particles cannot be reduced with the size of the tillage tool, and the possibility of difficulty in getting the soil in the trough into a condition sufficiently similar to that of soil under natural conditions are recognized, but it is believed that the method indicated may be a valuable supplement to work with full-size tillage tools in the field and that such indoor testing will be free from some obvious limitations of the field work.

Improvement of disk tools, A. W. Clyde. (Pa. Expt. Sta.). (*Agr. Engin., 20 (1939), No. 6, pp. 215–221, figs. 10; abs. in Pennsylvania Sta. Bul. 382 (1939), pp. 18, 19*).—Tests are reported on the effects of tool sizes, angles, loadings,

depths of penetration, and soil conditions on the design and operation of 18-in. disks, 1¾-in. concavity, 24 in. radius, 6⅝ in. spacing, upright position; 22-in. disks, 2½-in. concavity, 25[illegible]-in. radius, 9 in. spacing, upright position; 24-in. wheatland disks, 3⅝-in. concavity, 21⅝-in. radius, 8½-in. spacing, upright position; 24-in. disk plow, 3⅝ in. concavity, 25½-in. radius, tilted 21° backward at top; and offset disk harrow having twenty 22-in. diameter disks with 9-in. spacing. A large amount of data is presented and their application to design of tools discussed.

Why not left-handed disk jointers? E. V. COLLINS and C. K. SHEDD. (Iowa Expt. Sta.). (*Agr. Engin., 20 (1939), No. 10, pp. 387, 388, fig. 1*).—Preliminary experiments with left-handed disk coulter jointers on a 2-bottom, 16-in. plow conducted by the station and the U. S. D. A. Bureau of Agricultural Engineering showed that by this method landside pressure could be reduced. The quality of the finished plowing appeared to be equal to that obtained with other jointer equipment. However, the open-furrow wall was ragged, and there was some loose soil in the furrow bottom. The back-furrow ridge was less pronounced. This is because the jointer furrow was moved to the left where it becomes a part of the next furrow slice. The width and depth of cut were more uniform. When firmer soil is encountered, plow suction and landside pressure are increased, but forces produced by the disk jointer which oppose these forces are also increased.

Draft tests indicated that the 16-in. disk is preferable to the 14-in. or 18-in. disks.

Drying hay in the barn and testing its feeding value, J. W. WEAVER, JR., and C. E. WYLIE (*Tennessee Sta. Bul. 170 (1939), pp. 24, figs. 13*).—The authors discuss briefly previous devices for drying hay artificially, finding the large commercial types of equipment far too expensive both in initial outlay and in operating costs for any but large-scale operations, while schemes for driving or drawing air through hay stacked in the field, on wagons, or under open shelters are either inefficient when operated with unheated air or too expensive when the air used is electrically heated.

A satisfactory barn-drying system was developed on the basis of the observation that the moisture content of hay falls from about 75 percent to about 45 percent in the first 4 to 6 hr. of field drying on clear days. A barn drier is then capable of removing approximately 25 percent more moisture with economically practicable efficiency.

The design here sketched and described provides for a central longitudinal header air duct on the mow floor, ending 5 ft. from each end wall, with lateral ducts from 4 to 5 ft. apart, open at the bottom and raised 1 in. from the floor on 3- by 1-in. strips, the lateral ducts running to a like distance from the side walls. The header duct is, of course, reduced after passing each pair of opposite lateral ducts. For a 30- by 50-foot mow floor, a blower operated by a 5-hp. motor was used. The motor and blower assembly was placed on ground-floor level in a small room attached to the side of the barn. For the 30- by 50-ft. mow floor used, the central header duct was made 16 in. wide. The duct system was of wood.

It was found that the air leaving the hay should not carry more than from 70 to 80 percent relative humidity. When the air flow was reduced so that the escaping air had a humidity of from 90 percent to saturation the upper layers of hay remained very damp, and reversing the direction of the flow dried the top layers at the expense of making the bottom layers damp, moldy, and dusty. The most efficient air flow was determined to be 8⅓ cu. ft. per minute per square foot of mow floor. Barn drying from 45 percent moisture content to 20 percent required from 4 days to 2 weeks, according to weather conditions and the quantity

of hay stored. From 30 to 40 min. of blower operation at about 2 a. m. for 3 or 4 nights was provided by means of a timing clock to counteract a heating tendency observed during the first stage of drying. The most promising method of full automatic control consisted essentially of a thermostat and a humidistat in the motor starter control circuit. Overheating of the hay, and blower operation while the atmospheric humidity was too high for effective drying, were both prevented by these means. By using air drawn from under a 20- by 30-ft. false roof of sheet metal built over the barn roof on 2- by 4-in. supports, solar heat could be utilized to the extent of raising the air temperature 22° F., with a concomitant lowering of the relative humidity by 33 percent, at an intake rate of 3,000 cu. ft. per minute.

The barn-dried hay was found one grade and class better than the same hay field-dried, it showed average contents of 2.3 percent more leaves and 19 percent more green color, it had a better palatability and vitamin A value, and it was dried at an operating cost of about 86 ct. per ton. The initial cost of the barn drying system is stated as from $300 to $500.

Winter air conditioning: Forced warm-air heating, edited by S. Konzo (*Columbus, Ohio: Natl. Warm Air Heating and Air Conditioning Assoc., [1939], pp. VIII+532, pl. 1, figs. [192]*).—This book is based largely upon work in the warm-air heating research residence at the Illinois Engineering Experiment Station. This work, previously noted (E. S. R., 72, p. 420), is here supplemented with information from various other sources and with comments by the editor. Among other matters the contents deal with the development of the forced-air heating system; comparison of the gravity warm-air heating plant and the forced-air heating plant; winter air conditioning and human comfort; humidification and humidity controls; ventilation and infiltration; reduction of heat loss from house, and insulation; general performance characteristics of a forced-air heating system; room thermostats, controls, and zone controls; registers and grilles; design of duct system; selection of furnaces and burners; furnace capacities and efficiencies; and chimneys and draft. Appendix A contains a tentative code for testing and rating oil-fired, fan-furnace combinations; B, excerpts from a "technical code for the design and installation of mechanical warm-air heating systems"; and C, a survey of commercial practice relative to oil-burning furnaces.

Flow of heat through roofs, A. Molenaar and R. L. Perry. (Univ. Calif.) (*Agr. Engin., 20 (1939), No. 6, pp. 222–224, figs. 3*).—Tests to compare the heat absorption and transmission of a number of roof types and insulation applications showed that wood shingles on solid sheathing gave the best performance of any of the uninsulated roofs. Although galvanized iron on strips made a very hot roof, galvanized iron on sheathing was only about 25 percent hotter than wood shingles on sheathing and was considerably cooler than roll roofing or composition shingles. The heavy green slate-surfaced asphalt slabs, which are claimed to have some insulation value because of lengthwise air cells, proved only a little better than composition shingles.

The effect of bright aluminum paint was quite marked, making the galvanized iron on strips as cool as unpainted galvanized iron on sheathing and making that on sheathing as good as aluminum-painted wood shingles. On shingles the aluminum paint was as good as a 0.5-in. sheet of board form insulation placed against the sheathing.

Insulating board and the kraft paper intended to give air space insulation both gave better results between rafters than under rafters. The effect of insulation thickness can be roughly stated as follows: One-half inch stops from one-fourth to one-third of the heat which would flow through a wood shingle on sheathing roof; 1 in., one-third to one-half; 2 in. (1.75), one-half to two-thirds; and 4 in. (3.5), from two-thirds to three-fourths.

AGRICULTURAL ECONOMICS

[Articles and papers on agricultural economics] (*Jour. Farm Econ., 21 (1939), No. 3, pp. 555-670, figs. 3*).—The following articles are included: Demand Schedules—"Normal" and "Instantaneous", by R. L. Mighell and R. H. Allen (pp. 555-569) (U. S. D. A.); Theory of the Firm and Farm Management Research, by T. W. Schultz (pp. 570-586) (Iowa Expt. Sta.); Differentiation in Marketing Farm Products, by L. J. Norton (pp. 587-594) (Univ. Ill.); Wholesale Butter Prices and Premiums, by P. E. Quintus (pp. 595-605); The Theory and Measurement of Demand, by G. Tintner (pp. 606-613) (Iowa State Col.); and Japan's Agricultural Crisis, by W. Ladejinsky (pp. 614-631), and The Equilibrium Method of Tariff Analysis Applied to Egyptian Uppers Cotton, by C. F. Wells (pp. 632-650) (both U. S. D. A.). Notes are included on Comparison of Small and Large Farmers Under Proration Schemes, by H. E. Erdman (pp. 651-655) (Univ. Calif.); Investment Policy for Farm Purchases, by C. H. Hammar (pp. 655-661) (Univ. Mo.); Economic Aspects of Hybrid Corn—Further Considered, by R. L. Mighell (pp. 661-665) (U. S. D. A.) (E. S. R., 81, p. 587); The Municipal Milk Plant of Wellington, New Zealand, by W. Kling (pp. 665-668); and Intensity and Land Rent—A Rejoinder, by C. H. Hammar (pp. 668-670) (Univ. Mo.) (E. S. R., 81, p. 290).

[Papers presented before the Canadian Agricultural Economics Society] (*Sci. Agr., 20 (1939), No. 1, pp. 1-103, figs. 22*).—Included are the following papers presented at the eleventh annual meeting of the society held at Vancouver, B. C., June 19-22, 1939, in conjunction with the nineteenth annual meeting of the Canadian Society of Technical Agriculturists: Agricultural Policy in Canada, by C. B. Davidson (pp. 1-19); An Appraisal of the Movement to Increase Industrial Uses of Farm Products, by H. E. Erdman (pp. 20-28) (Univ. Calif.); The Development and Operation of Milk Control Boards, by B. A. Cooke (pp. 29-38); Milk Marketing Scheme of the Lower Mainland of British Columbia, by W. E. Williams (pp. 39-42); Legal Problems in Relation to Marketing Legislation, by T. G. Norris (pp. 43-50); Factors Affecting Efficiency in Dairy Farming, by H. R. Hare (pp. 51-60); The History of Agriculture in British Columbia, by M. A. Ormsby (pp. 61-72); The Significance of Agricultural Production and Trade in the Economic Development of British Columbia, by G. N. Perry (pp. 73-86); and The Relation Between Changes in the Rural Population and the Trend of Agricultural Production in British Columbia, by G. F. Drummond (pp. 87-103).

[Investigations in agricultural economics by the Pennsylvania Station, 1938-39]. (Partly coop. U. S. D. A.). (*Pennsylvania Sta. Bul. 382 (1939), pp. 12-15, fig. 1*).—Brief appraisals are made of the effects of the Soil Conservation Service programs in Lancaster County, by D. H. Walter, and in Centre County, by P. I. Wrigley. The important features of the "Smeltzer-type lease" are summarized by Wrigley, and a brief statement by C. W. Pierce is included on the decrease from 1937 in sales of fluid milk and cream in the Pittsburgh market in 1938.

Tenure status and land use patterns in the Corn Belt, J. A. Baker (*U. S. Dept. Agr., Bur. Agr. Econ., Land Econ. Rpt. 5 (1939), pp. [2]+65, fig. 1*).—This study was made to determine whether significant differences in land-use patterns and livestock enterprises exist between owner- and tenant-operated farms in the Corn Belt. It is based upon data obtained by the 1935 census of agriculture in one type-of-farming area each in South Dakota, Nebraska, Illinois, Ohio, and Indiana, and three in Iowa. An analysis is made of the relations of farm size to tenure status, and of tenure status to land utilization, man-land ratio, and livestock enterprises.

The tenant-operated farms were significantly larger than the owner-operated farms. Differences in the man-land ratio appeared to be related almost entirely to differences in size of farm rather than to tenure status. The system of land use on tenant farms was much more conducive to soil erosion. The tenants had relatively less pasture land and a larger proportion of both entire acreage and plowable acreage in crops. Tenants followed a more exploitative system in using their plowable land than did owners, and placed greater emphasis on crop production. Owners had more roughage-consuming livestock than tenants. The lack of any close relationship between the number of years the tenant occupant had operated the farm on which he resided in 1935, and the various criteria of farm organization indicate clearly that it is not to any great extent the frequent moves of tenant farmers that cause them to follow an exploitative system of farming." Insecurity of tenant tenure and the marked prevalence of crop-share leases were partial explanations of the differences in farm organization between tenants and owners.

A land-use classification of Benewah County, Idaho, C. TJERANDSEN and DWYER (*U. S. Dept. Agr., Bur. Agr. Econ., Land Econ. Rpt. 3 (1939), pp. [2]+42, figs. 6*).—The soils and physiography, present land use, population and public services, land-use problems, etc., are described. The lands are classified on the basis of recommended use into three major types with subareas and each described. Land settlement and ownership are discussed.

Land utilization in New Jersey: A land development scheme in the New Jersey pine area, A. T. M. LEE. (Coop. U. S. D. A.). (*New Jersey Stas. Bul. 657 (1939), pp. 50, figs. 7*).—This is a case study of a land development scheme in the New Jersey pine area, an area of generally submarginal land which covers one-third of the State. The beginning and actual development of the scheme are described. Facts are included and discussed concerning the owners of unimproved properties, the effects upon the taxes of the township, and the ownership status of the land in 1937. Suggestions are made for the solution of land utilization problems of the pine area.

A preliminary economic appraisal of the soil conservation program in the Beaver Run watershed, Westmoreland County, Pennsylvania, D. H. WALTER. (Coop. U. S. D. A.). (*Pennsylvania Sta., Jour. Ser. Paper 852 (1938), pp. [2]+24*).—This report is based on data from 90 full-time farms in 1935, from 47 cooperative agreements, and interviews with 33 farm operators in the spring of 1938. The agriculture of the area, the planned changes in land use under the Soil Conservation Service program, the adjustments already made, and the probable effect of the program during the next few years are discussed.

An analysis of pertinent social and economic factors affecting land use in Overton County, Tennessee: A study in the southern Appalachians, E. MASON and E. L. K. BRUEHN. (Coop. Univ. Tenn.). (*U. S. Dept. Agr., Bur. Agr. Econ., Land Econ. Rpt. 4 (1939), pp. [2]+83, figs. 13*).—The location and geographic characteristics of the area and the development of agriculture, forest industries, and coal mining are described. The land and human resources of the area and the institutional factors related to land-utilization problems are discussed, and suggestions are made for policies and programs for bringing about readjustments in land use.

Land classification for land use planning in the Great Lakes cut-over region as illustrated by Forest County, Wisconsin, W. F. MUSBACH (*U. S. Dept. Agr., Bur. Agr. Econ., Land Econ. Rpt. 1 (1937), pp. [2]+24, pl. 1*).—A land classification procedure for use in land-use planning in the area, based on a system developed for Forest County, Wis., is outlined.

A land program for Forest County, Wisconsin, based on an analysis of land use problems, V. W. Johnson, S. Henderson, and J. H. Marshall (*U. S. Dept. Agr., Tech. Bul. 687 (1939), pp. II+112, figs. 33*).—This bulletin analyzes and summarizes the data gathered in a project started in the summer of 1936 in cooperation with the Wisconsin College of Agriculture and the State planning board. Detailed studies were made of land ownership, utilization and taxation, the financial records and services performed by county and local governments, the school system of the county, and zoning in the county. A reconnaissance land classification was made and other factors studied in lesser detail. The data were gathered largely from records of State, county, and school districts. The first part of the bulletin discusses the nature of the more pressing problems of land use, taxation and local government, and the trends of a number of factors having a significant bearing upon these problems. In the second part an appraisal is made of the present policies and programs for adjustment in land use and local governmental organization, and some suggestions are offered as to types of readjustments that appear to offer possibilities for improvement of the conditions in the county. These are discussed under the headings of land classification, rural zoning, settler-relocation programs, public acquisition and management of land, and reorganization of local government.

Fire in land use and management, H. C. Hanson. (N. Dak. Expt. Sta.). (*Amer. Midland Nat., 21 (1939), No. 2, pp. 415–435*).—The ecological effects of fire are discussed under the headings of partial or complete destruction of plant and animal life and cover, modification of atmospheric factors, direct effect of temperature of fire upon the soil, effect of destruction of plant cover upon soils, and fire and plant succession. A list of 96 references is included.

The collection of rural real property taxes in Illinois, D. P. Flanders and M. C. Williams. (Coop. Univ. Ill.). (*U. S. Dept. Agr., Bur. Agr. Econ., Land Econ. Rpt. 2 (1938), pp. 68*).—The existing procedure for collecting delinquent real-property taxes in Illinois is analyzed and discussed, and suggestions made for improving its operation and facilitating the handling of the problems created by chronically delinquent lands.

Assessment and collection of farm real estate taxes in Kansas, H. Howe and L. F. Miller (*Kansas Sta. Bul. 283 (1939), pp. 93, figs. 6*).—This study was made to show the results of the present system of administration of the general property tax in the State, to indicate its weaknesses, and to suggest lines of remedy. It deals primarily with the assessment and collection of taxes during the period 1923–33. Data regarding the ratios of assessed value to sales value and real estate tax delinquency were obtained in cooperation with the U. S. D. A. Bureau of Agricultural Economics in a study made in 1934, regarding tax collection procedure from a questionnaire sent county treasurers, regarding sales value of farm lands from the Kansas Tax Commission, and regarding the township assessment system in Riley County from the county treasurer and county clerk. The present methods of assessing taxes, equalizing assessment, establishing the tax rate, and collecting taxes are described. The relations of total sales value, value per acre, number of acres, and improvements to ratio of assessed to sales value are discussed, and the amounts of and factors causing tax delinquency are analyzed and discussed for the State as a whole and for the northeastern, southeastern, central, and western sections.

Within the period 1923–30 there was a fairly constant relationship between assessed and sales value, from 67.1 to 70.3 percent. During the period 1931–33 the range was from 87.8 to 94 percent. In the latter period both land values and assessed valuation declined abruptly, but the decline in land values was the greater. In one farming area the average assessment during the years covered

the study was 50.3 percent of the sales valuation as compared with 81.2 percent in another area. The study of 2,935 land transfers during the period 1931-33 showed the ratios of assessed to sales value on the parcels ranged from 3 to 856 percent. Those with a price range of from 0 to $1,499 were assessed at an average of 166.2 percent, and those valued at more than $15,000 at 65.0 percent. The most significant factor affecting the ratio was value per acre. Number of acres was a minor factor, and assessors apparently made little distinction between grades of land. The detailed information on tax delinquency in 31 counties of the State showed that long-term delinquencies amounted to 7.6 percent of the total properties delinquent. During the 5-yr. period of 1928-32, 42.9 percent of the area studied was delinquent, and 66 percent of the properties delinquent in 1932 were delinquent in one of the previous years. The average period of delinquency was 2.1 yr. Higher tax rates were associated with land of lower productivity and with tax delinquency.

"A model assessment system in Kansas would call for greater use of the existing powers and duties of the State Tax Commission. The work of the commission could be improved by longer tenure of office, the employment of persons competent to supervise local assessment, and the establishment of a research department. Assessment could be improved by making the county rather than the township the assessment unit, with a full-time county assessor, appointed by the county commissioners, in charge. With this change the office of township assessor could be abolished. The cost of increased State supervision and the county unit system probably would be slightly larger than the cost of the present system."

Income parity for agriculture.—I, Farm income. III, Prices paid by farmers for commodities and services (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Adjust. Admin., and Bur. Home Econ., 1938, pt. 1, sect. 4, pp. [2]+II+30, figs. 8; 1939, pt. 1, sects. 7, pp. [2]+II+109, figs. 8; 8, pp. [2]+II+29, figs. 3; pt. 3, sects. 4, pp. [2]+II+24, figs. 5; 5, pp. [2]+V+55, figs. 8*).—These reports continue the series (E. S. R., 81, p. 439).

Part 1 includes the following sections: (4) Income from cattle and calves, calendar years 1909–37, by A. C. Brittain, includes tables and charts showing for the United States by years 1909–37 the cash and gross farm income from cattle and calves, the quantities sold and retained for home consumption, the average prices received by producers, the cost of cattle shipped in for feeding and breeding, and number and value of all cattle on farms January 1, and by States 1924–37 the income from cattle and calves and the cost of those purchased for feeding and breeding. (7) Income from corn, calendar years 1910–38, by L. Orr, R. F. Hale, C. M. Purves, and R. E. Johnson, includes tables and charts showing by years for the United States and by States the sales, home consumption, and cash and gross income, and the quantity and value of corn held for sale by farmers January 1. (8) Income from flaxseed, calendar years 1910–38, by L. Orr, R. F. Hale, C. M. Purves, and R. E. Johnson, includes similar data except in regard to home consumption and gross income for flax.

Part 3 includes the following sections: (4) Prices paid by farmers for farm machinery and motor vehicles, 1910–38, by A. G. Peterson, includes tables and charts showing indexes of prices paid by farmers for farm machinery other than motor vehicles, for motor vehicles used in production, for automobiles and tractors, wholesale prices of farm machinery including tractors, and tractors alone, and wholesale and retail prices of specified machines; the dispersion of prices paid by farmers for specified farm machines in 1937; and the average number of different pieces of machinery other than motor vehicles purchased annually per farm, the value of purchases, and the relative im-

portance in the index numbers of prices paid. (5) Index numbers of prices paid by farmers for commodities 1910–38, by A. G. Peterson, includes tables and charts showing the index numbers by years 1910–38 and by quarters 1924–38 of prices paid by farmers for all commodities used for living, production, and living and production combined, and for different commodities used for living and production. The commodities and price data used in constructing the index numbers, the base period used, method of construction, uses and limitations of the index numbers, the principal changes from the old series of index numbers, etc., are discussed.

[Farm management and appraisal of rural property] (*Jour. Amer. Soc. Farm Mgrs. and Rural Appraisers, 3 (1939), No. 1, pp. 7–24, 25–31, 42–44*).—Included are the following papers: Price Versus Value, by R. E. Nowlan (pp. 7–10); Types, Rates, and Methods of Depreciation of Farm Buildings, by H. B. Sommerfeld (pp. 11–17); Legal Responsibilities of Farm Managers and Their Clients, by T. D. Morse (pp. 18–24); Improvements and Farm Values, by W. J. Smith (pp. 25–31); and Price vs. Value From the Viewpoint of Pure Economic Theory, by H. W. Leonard (pp. 42–44) (Purdue Univ.).

Business analysis of farms in Utah County, Utah, W. U. FUHRIMAN and W. P. THOMAS (*Utah Sta. Bul. 289 (1939), pp. 72, figs. 19*).—The first part of this study presents an analysis of the development of agriculture in Utah County as compared with that for the State as a whole, and discusses trends in acreage of crops, intensity of crop production, crop yields, livestock production, size of farms, and production per farm. The second part, which is based chiefly on farm business records for 1935 for 481 Utah County farms, analyzes the acreages of principal crops, crop yields, intensity of production, number of animal units per farm, capital investment, receipts, expenses, income, etc., for each of the seven type-of-farming areas of the county. The third part includes a detailed analysis of the 481 records on the basis of types of farms, and makes comparisons of (1) the investment, acreages, yield, expenses, and income, and (2) the most profitable and least profitable farms of each type with the averages for the type. The causes of the differences in profitableness are discussed. In the analysis by types of farms, the farms are divided into (1) full-time farms, which are subdivided into specialized farms—dairy, poultry, fruit, truck, and field crops, and diversified farms—crop-dairy, crop-poultry, crop-dairy-poultry, and general farms; (2) ranches; and (3) part-time farms, i. e., farms having 150 or fewer man-work units of work on the farm and all others having 50 percent or more of the total productive man-work units away from the farm, or more than 50 percent of receipts from work off the farm.

The number of farms in Utah County increased from 3,561 in 1930 to 4,004 in 1935. In 1935 yields from crops and livestock were from 5 to 10 percent lower, number of livestock about 10 percent lower, total agricultural production about 20 percent lower, and cash receipts for full-time farms from 30 to 40 percent lower than the averages for the period 1926–31. The average labor income per farm by type-of-farming areas varied from —$288 to $366, and labor earnings (labor income plus value of farm privileges) from $50 to $754. The average labor earnings for different types of specialized farms were dairy $787, poultry $1,210, fruit $209, truck $663, and field crops $360; for different types of diversified farms, crop-dairy $514, crop-poultry $635, crop-dairy-poultry $879, general crops $177, and general livestock $566; for ranches $627; and for part-time farms where no work was done off the farm $41, where less than 50 days' work was off the farm $143, and where there was 50 days or more work off the farm $198. Labor earnings increased directly with the quantity of production per farm from $122 for

farms with production indexes of less than 50 to $1,085 for those with production indexes of more than 150. There were positive correlations between labor income, yields, and size of farm. Yields can be increased by seed selection, improved practices, increased use of fertilizers, more efficient use of irrigation water, etc. Size of farm, as used in the study, may be increased by increasing acreage, number of livestock, or intensity of crop and livestock enterprises.

A farm management study of 60 dairy farms in Puerto Rico, 1935–36, R. HUYKE (*Jour. Agr. Univ. Puerto Rico [Col. Sta.], 23 (1939), No. 3, pp. 131–175, figs. 5*).—This study is based on records obtained by the survey method and covering the farm operations for the year ended June 30, 1936, for 60 dairy farms in the vicinity of San Juan. The climate, soils, topography, transportation facilities, markets, etc., of the area are described. An analysis is made of the distribution of capital, use of land, crops, crop yields, kinds and value of livestock, data as to the dairy herds, farm receipts, expenses and returns, value of farm privileges, labor income, returns on capital, etc., and the relation to farm earnings of size of farm, number of cows, milk production per cow, labor efficiency, diversification of enterprises, age and tenure of operators, and methods of marketing milk.

The average size of the farms was 248 cuerdas (240.6 acres), of which 65 were in crops and 166 in permanent pastures. The average number of cows per farm was 81, with an average milk production of 1,629 qt. Milk sales per farm averaged 125,341 qt., with a value of $11,958. Milk sales represented 70 percent of the total receipts. The average labor income per farm was $2,569, the average value of farm privileges $479, and the returns on capital invested 10.1 percent.

Labor income showed a consistent increase as size of farm increased. The third of the farms with the most cows had a labor income of $4,692, the third with the least number of cows $2,012, and the middle third $1,003. The farms with lowest milk production per cow had the lowest labor income and those with the highest production the highest. The amount of milk handled per man showed no consistent relationship to labor income, due to the fact that the farms with the lowest efficiency had much higher receipts from sugarcane. The farms with the smallest percentage of receipts from crops had the highest and those with the highest percentage the next highest labor income. Tenure did not affect labor income significantly. The farmers selling milk at wholesale had the lowest and those selling at both retail and wholesale the highest labor income. Farms above the average in any one of the following factors—total cuerdas in farm, number of cows, man equivalent, value of milk sales per cow, milk production per cow, 100 qt. of milk handled per man, and percentage income from crop sales—had an average labor income from 1.5 to 2 times the average for all farms. On farms with two of the factors above the average, the labor income averaged about 2.5 times the average for all the farms. With three factors above the average the labor income averaged about 2.5 to 3 times, and with four factors above the average about 3 times the average for all farms.

Farm organization for beef cattle production in southwestern Minnesota, G. A. SALLEE, G. A. POND, and C. W. CHICKMAN. (Coop. U. S. D. A.). (*Minnesota Sta. Tech. Bul. 138 (1939), pp. 80, figs. 13*).—This bulletin is based chiefly on the detailed study of the organization and operation of representative beef cattle farms in Rock and Nobles Counties during the period 1929–31 (E. S. R., 71, p. 548). It describes the characteristics of southwestern Minnesota favorable to the selection of beef cattle as a farm enterprise, and the systems of farming and beef cattle production in the area. The adjustments needed in the organization of the farm business, the problems involved in planning for beef cattle production, the analytical process in such planning, the basic data needed and the sources of such data, the planning of the crop system, and balancing crop and

livestock are discussed. Data on the unit physical costs of production and the seasonal distribution of the use of labor and power have been summarized into ranges, averages, and standards for the significant items.

To illustrate the budget method of planning and to estimate the probable advantages in increased returns of a closer adjustment of the farming system to the farmer's productive resources, budgets under the present organization and under a suggested reorganization are set up for a milk-and-beef farm, a baby-beef farm, and a farm organized for feeding purchased cattle, using the normal or average crop yields, livestock production, and productive requirements for the particular farm. Tables and charts show for each farm under the present and suggested organization the distribution of acreage, the production and disposal of crops, the number, production, and disposal of livestock and livestock products, weekly distribution of man labor, the normal returns, and other information as to feed, labor, materials, and services used in livestock production. The probable difference in normal returns under the suggested reorganization of the three farms are shown to be milk-and-beef farm $400, baby-beef farm $524, and for the farm feeding purchased cattle $1,186.

An economic study of dairy farming in Oktibbeha and Lowndes Counties, Mississippi, 1936–1937, M. Guin (*Mississippi Sta. Bul. 324 (1938), pp. 27, figs. 9*).—This study is based chiefly on farm business records for 56 representative farms for the year ended July 31, 1937, obtained by the survey method, and data secured from companies buying milk in the area. The area, the farming practices, and the milk marketing practices are discussed. An analysis is made of the size of business, sources and amount of income, distribution of capital, value of inventories, and factors affecting profits, etc.

Of the total cash receipts on the farms studied 42.3 percent was from dairying, 35.8 percent from cotton and cottonseed, and 21.9 percent from miscellaneous enterprises. The average number of cows per farm was 18.5, varying from 5 to 78 on the different farms. The amount of butterfat sold per cow per farm averaged 101.6 lb. and varied from 28 to 272.5 lb. The average annual sale per farm was 1,814 lb. The net profits of 56 farmers varied from $1 to $2,486, averaging $724. The labor incomes averaged $523, ranging from —$131 to $1,868. There were direct correlations between total profits per farm and both size of herd and number of acres in cotton. Production per cow was found to be the weakest phase of farm management in the two counties. Lack of a well-planned roughage-producing program was a weakness on most of the farms. It is suggested that an efficient dairy farm might consist of from 20 to 35 cows combined with cotton and such other enterprises as may be fitted in without serious conflict with the dairy enterprise.

Preliminary report of the cost of milk production on 79 dairy farms in four areas of Pennsylvania, 1938, W. L. Barr (*Pennsylvania Sta., Jour. Ser. Paper 923 (1939), pp. [2]+21, figs. 2*).—This study was based on data obtained from 24 farms in the northeastern, 28 in the southeastern, 14 in the central, and 13 in the western part of the State. Tables are included and discussed showing the characteristics of operators, land use, numbers of livestock of different kinds, investment in dairy enterprises, sources of cash farm income, and costs of producing 100 lb. of milk.

The cost of producing 100 lb. of milk varied from $1.16 to $3.40 for different farms and averaged $1.89. The wide range in costs was due primarily to variations in labor efficiency, size of herd, and production per cow. Hauling and marketing costs averaged 24 ct. per 100 lb. of milk. The milk receipts per cow, labor income, and returns per $100 worth of feed and bedding were $137, $904, and $186 for the third of the farms (26) with the lowest costs, $152, $590, and

$202 for the middle third, and $136, $313, and $179 for the third with the highest costs.

Milk price control in the United States, January 1, 1938, E. F. Anderson (*Pennsylvania Sta., Jour. Ser. Paper 894 (1939), pp. [1]+7, figs. 2*).—A brief statement of the extent and types of milk control in effect.

Sales of milk and cream for fluid use in Allegheny County, Pennsylvania, November 1936, C. W. Pierce (*Pennsylvania Sta., Jour. Ser. Paper 788 (1937), pp. [2]+14+[4], fig. 1*).—Data are included showing the daily per capita consumption of fluid milk in Allegheny County 1926, 1930, 1932, 1933, and 1936; the indices of fluid milk receipts at New York City, Boston, and Philadelphia, and of per capita consumption of fluid milk in Allegheny County by years 1930–36; the weekly per capita consumption of fluid cream in Allegheny County 1932, 1933, and 1936; and the sales of raw milk 1926, 1930, 1932, 1933, and 1936. Other tables show for the 71 dealers in Allegheny County selling pasteurized milk the receipts and utilization of milk, and the wholesale and retail sales of fluid milk and fluid cream November 1936. An analysis is also made of the retail and wholesale sales of 20 large pasteurizing distributors in August 1922 and November 1936, the retail prices per quart for milk from stores and dealers' wagons in the Pittsburgh market during different periods January 1931 to August 1937, the proportions of milk of different grades sold wholesale and retail, the size of containers used, the proportion of fluid cream sales of different butterfat tests, and buttermilk, chocolate drink, and fruit drink sales of the 20 large distributors in November 1936.

Costs and practices in producing honey in Oregon, A. S. Burrier, F. E. Todd, H. A. Scullen, and W. W. Gorton. (Coop. U. S. D. A.). (*Oregon Sta. Bul. 362 (1939), pp. 38, figs. 4*).—Cost records were obtained from 102 cooperators covering the operation of 93 apiaries in 1931 and 87 in 1932 in the fireweed, mixed-blossom, and alfalfa-clover regions of the State. Ninety-one of the cooperators produced mainly extracted honey and 11 specialized in comb honey. The study included 34,279 colonies of bees producing 2,182,668 lb., or about half the production of the State during the period. Honey production in the United States and Oregon, the organization of bee farms, and efficiency factors are discussed.

The average investment per colony was $10.02, being $9.08 in the alfalfa, $10.74 in the mixed-blossom, and $13.19 in the fireweed regions. The average gross cost for the 2-yr. period of producing extracted honey was $4.48 per colony and 7 ct. per pound of honey. The credits for byproducts amounted to 64 ct. per colony or 1 ct. per pound of honey. The net cost per pound varied from under 4 ct. (average 3.3 ct.) for 29 apiaries to over 20 ct. (average 29.4 ct.) for 10 apiaries. Twenty-two percent of the apiaries produced more than 80 lb. of honey per colony at a cost of 4.2 ct. per pound, as compared with a yield of less than 30 lb. per colony at a cost of 16.1 ct. per pound for 20 percent of the apiaries. Of the gross cost for extracted honey 34 percent was for labor, 12 percent for materials and supplies, 18 percent for miscellaneous expenses, and 36 percent for depreciation and interest. The apiaries specializing in comb honey had an average gross cost per colony of $5.40 and credits $1.27, and a net cost of 10.3 ct. per pound of honey. Of the gross cost 50 percent was labor, 17 percent for materials and supplies, 15 percent for miscellaneous expenses, and 18 percent for depreciation and interest.

The most important factors affecting the cost of production were found to be yield per colony, use of labor, disease control, regional differences, and skill in manipulating colonies to assure full strength at the major honey flow.

Marketing Maryland turkeys, P. R. Poffenberger and S. H. DeVault (*Maryland Sta. Bul. 429 (1939), pp. 85-115, figs. 3*).—Data for the production and marketing year 1937-38 were obtained from 191 turkey producers by questionnaire and personal interviews. The survey was limited almost entirely to flocks of 100 or more turkeys, and included 48,650 birds in the Eastern Shore region, 19,303 in the Piedmont region, and 6,390 and 6,460, respectively, in the southern and western Maryland regions. Tables are included showing, usually by regions, the methods of sale, market outlets, month of sale, methods of delivery, average weight, and average prices received. The preparation of birds for market, the cost of marketing, markets for Maryland turkeys, marketing practices, and consumer preferences are described. The sources of receipts of the Baltimore market, the monthly distribution, trade channels, and methods of shipment are discussed. The proposed marketing program of the Maryland Turkey Producers Association is briefly described. Appendixes include the proposed voluntary grades by the association and the tentative specifications for U. S. standards and grades.

Of the turkeys marketed in the study, 48.8 percent were sold alive at the farm and 20.5 percent alive at the city market. Twenty-one percent were sold direct to consumers, 43 percent to local buyers, and 25.1 percent to commission merchants. In November and December 83.5 percent were sold and in October 11.7 percent. The average prices ranged from 24.6 ct. per pound for live birds at the farms to 33.4 ct. for those sold dressed retail. The cost of marketing (6,445 turkeys) averaged 75 ct. per bird and 5.6 ct. per pound dressed weight. The average consumers, according to the producers, prefer an 11.7 to 13.7 lb. turkey hen and an 18.1 to 21.3 lb. tom. Baltimore received only about 25 percent of the Maryland turkeys, and less than 1 percent of the dressed receipts came from Maryland. Only about 15 percent of the receipts in Baltimore came from Maryland.

Cold storage lockers in Pennsylvania, W. R. Whitacre (*Pennsylvania Sta., Jour. Ser. Paper 913 (1939), pp. [1]+8, fig. 1*).—This study was made to determine the nature, location, and extent of the cold storage locker business in the State and its effect upon the marketing of agricultural products. It is based on data from 23 establishments secured by questionnaires and interviews, and by interviews with patrons when they were removing food from the lockers. A table shows the location, size, number of years of operation, and types of service rendered by each establishment. The facilities and services, rental and service charges, ownership, and the advantages and disadvantages to farm and town patrons are discussed.

The agricultural industries, D. W. Malott and B. F. Martin (*New York and London: McGraw-Hill Book Co., 1939, pp. VIII+483, [fig. 1]*).—This volume "is designed to present the business aspects of purchasing, processing, financing, and marketing the chief agricultural raw materials entering into American industry and commerce, and to analyze the business problems peculiar to these industries because of their economic, political, and social significance in the life of the nation." The aim is "to present in brief compass the historical development, statistical position, technical processes, handling methods, and relations to government necessary to an analysis and understanding of the problems faced by the executives in these industries." In addition to published data, the authors have drawn on actual business problems collected by them at first hand from industries for use in a course in the agricultural industries in the Harvard Business School. A selected bibliography is included.

Trading for others in commodity futures (*U. S. Dept. Agr. Cir. 539 (1939), pp. 29, figs. 8*).—This circular reports the findings of the Commodity

Exchange Administration's first investigation of controlled commodity futures accounts—accounts over which persons other than the owners exercise trading control. Following a preliminary analysis of data regarding such trading during the first 8 mo. of 1937, a detailed investigation was made of the nature and results of the trading in a large number of accounts controlled by commodity counselors. Tables and charts are included and discussed showing the number and geographic distribution of controlled accounts, and the number of accounts controlled by commission merchants and individuals. The qualifications of, and methods of promotion and control used by, commodity counselors, and the nature and profitability of their trading are discussed and illustrated. The courses used by the Commodity Exchange Administration in regulating commodity counselors are described.

Of the 805 commission merchants reporting, 562 reported no controlled accounts during the first 8 mo. of 1937. The other 243 firms had 4,488 controlled accounts operated by 3,257 individuals. Of the individuals, 82 percent controlled only 1 account (57.4 percent of the accounts), 16.2 percent from 2 to 5 accounts (28.1 percent of the accounts), and 1.8 percent over 5 accounts (14.5 percent of the accounts). Commodity counselors controlled approximately 13 percent of the accounts, partners of commission houses 8 percent, employees of commission houses 2 percent, corporation executives 4 percent, and relatives of owners 36 percent. Thirty-seven percent were unclassified, of which a large proportion were probably controlled by relatives or close friends. "Of the 16 counselors who controlled 10 or more accounts each during the first 8 mo. of 1937, 15 lost money for a majority of their clients [and] only 1 made profits." All accounts controlled by 5 counselors lost money. Four others controlled only one profitable account. "In general it was found that commodity counselors obtained accounts on the basis of misleading statements and misrepresentations of fact, that many accounts were operated in a manner which misled the owners, that the mode of operation of some of them may have impeded the price-determining functions of the commodity markets, and that the overwhelming majority of these accounts was unprofitable."

Attitudes of farmers toward cooperative marketing, G. F. HENNING and E. B. POLING (*Ohio Sta. Bul. 606 (1939), pp. [1]+36*).—Data as to the knowledge of and information concerning cooperative marketing, opinion and attitude toward livestock marketing, particularly cooperative marketing, criticisms of such marketing, and suggestions for improvement were obtained by personal interviews with 131 farmers in the Cincinnati area, 50 in Pickaway County, 54 in the Columbus area, 71 in the Cleveland area, and 20 in Auglaize County. Tables are included and discussed showing, usually by areas, the market outlets used and reasons for their use, tenure of farmers, their membership in livestock cooperative marketing associations and other farm organizations, and the reasons for becoming or not becoming members of cooperative livestck marketing associations. Other tables and discussions cover the knowledge the farmers had of their cooperative livestock associations through publications and letters, personal contact with association representatives, livestock meetings, radio, etc., and information the farmers desire. The farmers' reasons for considering cooperative livestock associations valuable and their criticisms and suggestions are tabulated and discussed.

As a result of the study the authors state that serious consideration should be given to associations arousing a desire by farmers for more information concerning cooperatives, furnishing more educational rather than propaganda information, distributing information to farmers continuously at regular intervals, securing a mutual understanding between the management and members

of associations concerning the problems of the association, and bringing about a general acceptance of the cooperative association and thereby increasing membership and performing a more efficient service for patrons so that it will equal or exceed that of competing agencies.

Crushing cottonseed cooperatively, J. S. Burgess, Jr. (*Farm Credit Admin.* [*U. S.*], *Coop. Res. and Serv. Div., Cir. C-114* (*1939*), *pp.* [2]+27, *figs.* 7).—This circular describes the conditions that should exist before establishing a cooperative cottonseed-oil mill, the most desirable organizational structure under various local conditions, and the important operating policies and practices that contribute to the success of such a mill. It is based largely on information regarding cooperative mills already in operation.

World cotton situation (*U. S. Dept. Agr., 1939, pp.* [2]+*XXIV*+*120*).—This publication was prepared for use at the International Cotton Meeting. The world cotton situation, development of the current situation, carry-over, production, supplies, consumption, international trade, and prices are discussed briefly. Tables are included showing for the United States and other countries the acreage, yield, production, exports, imports, mill consumption, stocks, carry-over, supply, distribution, prices, price differentials, price ratios, etc., for cotton, farm income and returns from cotton and cottonseed, data as to cotton textiles and cotton manufacturing, cottonseed and cottonseed products, and some information as to silk, rayon, and wool.

Cotton handbook with related data (*U. S. Dept. Agr., Agr. Adjust. Admin., Statis. Pub. 2* (*1939*), *pp. II*+*46*).—Statistical data are included for cotton on acreage, yield, and production, supply and distribution, stocks and carry-over, exports, imports, price and income, loans, cost of production, staple length, and planting and picking dates. Data are also included on rayon and other textiles, foreign trade, national, farm, and nonfarm income, and population.

Tobacco production and consumption in India and Burma, J. B. Gibbs (*U. S. Dept. Agr., Off. Foreign Agr. Relat., F. S. 79* (*1939*), *pp. IV*+*75, figs. 16*).—Information regarding the origin, development, and trends in tobacco production and consumption, the economic, soil, and climate factors affecting production, classes and types of tobacco grown, grading and marketing, imports and exports, manufacture and consumption of pipe and chewing tobacco, cigars, cigarettes, snuff, cheroots, etc., tobacco taxes, etc., is brought together and discussed. The last section of the report includes a number of statements of the significance to the tobacco farmers of the United States of the possible trends during the next few years in India and Burma in tobacco production, consumption, imports, and exports. Appendixes include statistics as to tobacco exports from and imports into India, including Burma, the text of a sample contract between flue-cured tobacco grower and the Indian Leaf Tobacco Development Company, Ltd., and rules for grading and marking Indian tobacco established under the authority of The Agricultural Produce (Grading and Marketing) Act, 1937.

World wheat survey and outlook [May and September 1939] (*Wheat Studies, Food Res. Inst.* [*Stanford Univ.*], *15* (*1939*), *No. 8, pp.* [2]+*365–400, figs. 7; 16* (*1939*), *No. 1, pp.* [2]+*38, figs. 6*).—These numbers continue the series (E. S. R., 81, p. 294), data for May being reported by V. P. Timoshenko and H. Working and for September by H. C. Farnsworth and Working.

"In mid-May there was fair prospect that the world wheat surplus of 1939–40 would be smaller than that of 1938–39. As the weeks passed this prospect gave way to expectations of an increased surplus. Resulting price declines of 20 to 25 percent to late July carried Liverpool prices in sterling to the lowest level since futures trading began in 1883. The period of price decline was characterized by heavy absorption of import wheat for security reserves in Europe. May–

July shipments of wheat, unprecedentedly heavy in relation to shipments in earlier months, brought world net exports in 1938–39 to the highest total in 7 yr. Prospects for war, and its eventuation, dominated wheat price developments after mid-August. At Chicago there was an unprecedented advance of 21 ct, and at Winnepeg of 24 ct. in the five trading days beginning September 1. Subsequent reaction and partial recovery left North American prices on September 26 about 20 ct. higher, in United States currency, than in mid-August.

"The outlook for trade and prices depends heavily upon unpredictable political and military developments. Under continued warfare, not materially widened as to belligerents, most European importing countries may be able to maintain wheat consumption at levels not far below other recent years without reduction of reserves built up last year. Should this prove true and should non-European nations reduce their imports by about 25 million bushels, world net exports might be 70 to 120 million bushels smaller than in 1938–39."

"World" wheat stocks, 1890–1914 and 1922–39, H. C. FARNSWORTH (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 16 (1939), No. 2, pp. [1]+39–66, figs. 8*).—"The stocks series here presented show two major periods of persistent wheat surplus—1893–96 and 1929–35—and 5 yr. of notably small stocks—1898, 1909, 1925, 1937, and 1938. As compared with the prewar period, the two decades since the war have been characterized by much heavier wheat surpluses and less marked wheat shortage."

Statistical analysis of the seasonal average f. o. b. prices of California oranges, 1922–23 to 1937–38, H. R. WELLMAN (*California Sta. Mimeog. Rpt. 68 (1939), pp. [1]+16, figs. 6*).—Tables and charts are included showing the relations of the United States supply of oranges, index of nonagricultural income in the United States, and trend of demand for oranges on the f. o. b. prices of all California oranges, California winter oranges, and California summer oranges. During the 16-yr. period these three factors accounted for about 94, 90, and 92 percent, respectively, of the variations in the f. o. b. prices.

A study of the consumption of fats and oils in Minneapolis, 1938, W. C. WAITE and R. W. COX (*Minnesota Sta. Bul. 344 (1939), pp. 20, figs. 9*).—This study is based on data collected from 2,421 families in 236 selected areas in Minneapolis, and from hospitals, restaurants, and 1,319 retail stores. The method used in the survey was similar to and the areas studied the same as those in previous studies reported in Bulletins 311 (E. S. R., 72, p. 714) and 321 (E. S. R., 74, p. 561). Most of the common fats were included, and some data on cream consumption collected during the study were used in the explanation of certain points. The relative importance of the various fats in bakeries, hotels and restaurants, and hospitals, and retail prices of fats are discussed.

The weekly per capita consumption of the different fats and the percentage of the total consumption as shown by the consumers' survey were: Butter 0.67 lb. and 54.9 percent, margarine 0.01 lb. and 1 percent, lard 0.13 lb. and 10.3 percent, lard substitutes 0.16 lb. and 13.3 percent, salad oil 0.02 lb. and 1.7 percent, peanut butter 0.08 lb. and 6.4 percent, spreads 0.01 lb. and 0.9 percent, and dressings 0.14 lb. and 11.5 percent. The consumers' survey when compared with the sales reported by the stores showed a higher consumption of butter and lower consumption of margarine and lard substitutes. Expenditures on the fats and oils included about 12 percent of the total food expenditures reported. Total per capita purchases of fats per week increased from 1.14 lb. for the families with a per capita income of under $300 to 1.36 lb. for those with an income of from $600 to $899, but were only 1.3 lb. for those with incomes of $900 and over. The cost per pound increased from 25 ct. to

26.9 ct. and 28 ct., respectively, in the two highest income classes. Consumption of butter, lard substitutes, and dressings tended to increase and those of lard, margarine, and peanut butter to decrease as incomes increased. The per capita consumption of butter decreased and that for peanut butter increased as size of family increased, because of number of children. The consumption of lard and lard substitutes remained about constant. The native white, Scandinavians, British, and north and central Europeans showed a similarity in consumption pattern. Southern Europeans showed a heavy consumption of salad oils and a greater use of margarine. For the Jewish families butter consumption appeared unusually low and lard was avoided. Negroes were small consumers of butter but extremely heavy users of lard.

Agricultural statistics, 1939 (*U. S. Dept. Agr., 1939, pp. [1]+597*).—Statistics prepared under the Yearbook Statistical Committee on grains, cotton, sugar, tobacco, fruits, vegetables, tree nuts, miscellaneous crops, beef cattle, hogs, sheep, horses, mules, dairy cattle, dairy products, poultry, poultry products, foreign trade in agricultural products, farm business and related subjects, and miscellaneous subjects—forestry, weather, roads, etc., similar to those in the series (E. S. R., 80, p. 267), are included.

Farm accountancy statistics for 1934–35 and 1935–36, A. Brizi (*Inst. Internatl. Agr. [Rome], Comptab. Agr. Rec. Statis., 1934–35, pp. XIX+95; 1935–36, pp. XIX+95*).—These are the seventh and eighth volumes of the series (E. S. R., 79, p. 703).

RURAL SOCIOLOGY

The field of research in rural sociology (*U. S. Dept. Agr., Bur. Agr. Econ., 1938, pp. [2]+47*).—"This report [prepared by a committee of the Rural Sociological Society of America and the Bureau of Agricultural Economics] represents an attempt at an appraisal of what rural sociology has accomplished in the past and what it can and should mean to agriculture and rural life in the future."

Agriculture in modern life, O. E. Baker, R. Borsodi, and M. L. Wilson (*New York and London: Harper & Bros., 1939, pp. VII+303, [pl. 1], figs. 40*).—Part 1, Our Rural People, by O. E. Baker (pp. 3–183), includes chapters on rescuing for human society the native values of rural life, the impact of science, invention, and mechanical power on agriculture, the poverty of the rural people, the drift of farm youth and wealth to the cities, conspicuous consumption and the concentration of wealth, food consumption in the low income groups, the declining birth rate, some agricultural implications in the declining birth rate, the conservation of human resources, and suggestions. Part 2, A Plan for Rural Life, by R. Borsodi (pp. 187–211), consists of chapters on agriculture and modern life, agriculture and the machine age, and agriculture and the high cost of distribution. Part 3, Science and folklore in rural life, by M. L. Wilson (pp. 215–266), includes chapters on patterns of rural cultures, folklore farming and scientific, commercial agriculture, and the search for new rural culture patterns. Part 4, The future of rural life, is a dialogue written by O. E. Baker, R. Borsodi, and M. L. Wilson (pp. 269–283).

Changes in size of rural families, D. E. Lindstrom. (Univ. Ill.). (*Ill. State Acad. Sci. Trans., 31 (1938), No. 2, pp. 63, 64*).—Farm families are getting smaller to an extent whereby Illinois may soon have to depend upon immigration for an increase in population. The rate of decrease in size of families in the State is greater for rural than for urban areas.

Natural increase and migration of Kentucky population, 1920 to 1935, M. Oyler (*Kentucky Sta. Bul. 395 (1939), pp. 233–280, figs. 15*).—During the decade from 1920 to 1930, Kentucky population had high rates of natural growth,

index of natural increase for 1930 being 100 or more in all but 5 of the 120 counties. These 5 counties include the major areas of urban concentration in Kentucky. In contrast to the areas of urban influence stands the rural territory of eastern Kentucky, where 7 counties have indexes above 225. The population in these 7 counties would double in size by natural increase within from ... 33 yr. if no migration were to occur.

In every county of Kentucky the rural farm population showed natural increase in 1930. However, proximity to large cities depressed the rate among farm people. The negro population of Kentucky is barely self-maintaining, the index of natural increase being only 102 in contrast to 146 for the State's white population. The negro index is consistently lower than the white in all groups—rural farm, rural nonfarm, and urban, and failed to offset emigration and resulted in a decline of negro population during the two decades from 1910 to 1930. Since 1930 the trend of negro births has continued downward, indicating natural decrease.

Movement of farm population, South Dakota, 1938, W. F. KUMLIEN and ... McNAMARA. (Coop. U. S. D. A. et al.). (*South Dakota Sta. Cir. 26 (1939), pp. 6, fig. 1*).—This study shows the movements of population in and out of South Dakota in 1938.

A study of natural communities in three Oregon counties, P. A. PARSONS *[Portland]: Oreg. State Planning Bd., 1937, pp. [9]+56, [pls. 11]*.—This is an attempt to determine the importance of natural communities as a basis for community planning in country districts.

Social characteristics of part-time farmers in Washington, C. F. REUSS *(Washington Sta. Bul. 380 (1939), pp. 26, fig. 1)*.—This study is based on a field survey of part-time farmers in 19 counties.

The fact that the part-time farm population contains an abnormally large proportion of middle-aged and of large families supports the view that part-time farming represents a quest for security, as it is to these groups that the lack of security becomes most evident, and through a combination of farming and nonfarm employment, they hope to make the best of an unfortunate situation. Skilled workers and the laboring classes generally are found in the part-time farm population to an unusual degree.

While rent is reduced by the home ownership characterizing part-time farming, the expense of transportation becomes a considerable item and in many cases practically cancels any savings the family may make in rent. Expenditures for groceries rank first among part-time farm families, for transportation second, for clothing third. The farm contributed an average of $150 over operating expenses to the family living. Nonfarm employment returned an average income of $746. For somewhat over one-fourth of the families, income from such sources as gas station operation, pensions, and taking in boarders and lodgers brought in an average of approximately $280. A heavy indebtedness amounting to over one-third of the value of their land and buildings hung over the heads of these part-time farmers as a constant threat to the security of their investment. That many of them fail to attain their security is shown by the 22 percent who received relief assistance during the year 1933. On the whole, the higher the outside income the lower the proportion of those receiving relief. This emphasizes the importance of a sizable outside income.

Rural unemployed not receiving assistance, T. J. WOOFTER, JR. *(Fed. Works Agency, Work Proj. Admin., Res. Bul. 18, 2. ser. (1939), pp. [3]+15)*.—The author presents data for a southern and a northern and western area of 10 counties each considered generally representative of the rural situation.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Training teachers of agriculture for Pennsylvania schools, H. S. Brunner (*Pennsylvania Sta. Bul. 382 (1939), pp. 61, 62*).—Data are included as to the percentage of graduates of the school of agriculture of the Pennsylvania State College teacher-training courses from 1935–36 to 1937–38 and placed as teachers of agriculture, the percentage of teachers of agriculture in Pennsylvania attending summer school at the State College, and the percentages of credit hours of technical and elective subjects in the various preparatory curricula for teachers of vocational agriculture and in professional courses at the college. Comparisons are made with the averages for all institutions in the North Atlantic region.

Methods and materials for teaching biological sciences: A text and source book for teachers in training and in service, D. F. Miller and G. W. Blaydes (*New York and London: McGraw-Hill Book Co., 1938, pp. XII+435, figs. 146*). This book was prepared for teachers of elementary courses in the biological sciences ranging from junior high school to junior college. The two main subdivisions deal, respectively, with principles and classroom methods and preparation and uses of classroom materials.

Serving farm people on many fronts: Annual Report of the Extension Service, C. W. Warburton and R. Brigham (*U. S. Dept. Agr., Ext. Serv. Rpt., 1937, pp. [1]+40*).—This is the annual report of the Extension Service on work in agriculture and home economics in 1937 (E. S. R., 82, p. 273). It describes the activities of the agricultural, home demonstration, and club agents, and discusses the influence and results of the work. The appendix includes tables summarizing the activities and results in the work with crops, livestock, forestry, engineering, conservation, agricultural economics, home economics, poultry and miscellaneous, and boys' and girls' projects. Other tables include data as to the number of counties by State with extension agents July 1, 1925, 1930, 1937, and 1938, and the expenditures by States during the year ended June 30, 1937, by sources of funds, by projects, and by items of expenses, with comparisons with totals for the United States for the years 1932–36.

FOODS—HUMAN NUTRITION

Food and health, A. B. Callow (*Oxford, Eng.: Univ. Press, 1938, 2. ed., pp. [VIII]+168, [pls. 4], figs. [5]*).—This book, originally published in 1928, has been enlarged and almost entirely rewritten to include recent research on foods and nutrition. Written primarily for the layman, the book is designed to show what food factors are required and how to obtain them. The chemical composition of food, the changes that take place in digestion, the way food provides energy, and the history and significance of vitamins are discussed in early chapters. These are followed by chapters on the scientific analysis of dietary standards and the merits of ordinary foods. The principles of meal planning are discussed in general terms, and suggestions are made concerning diets for mothers and children. Food in disease and food fads are considered very briefly. Tables on the mineral, vitamin, and proximate constituents in a limited number of foods are compiled from credited sources (chiefly English), and a bibliography of related works is included.

Gastronomic bibliography, K. G. Bitting (*San Francisco: [A. W. Bitting], 1939, pp. XIII+718, [pls. 6, figs. 65]*).—This volume is a very extensive annotated bibliography (arranged alphabetically by authors) of books on foods. The books are primarily on food preparation, and most of the material cited is nontechnical, although a few technical publications are also listed. Old and modern and domestic and foreign publications are cited.

Nutrition and human welfare, L. A. Maynard. (Cornell Univ.) (*Sigma Xi Quart., 27 (1939), No. 2, pp. 84–90, 102*).—An address.

The effect of melting point of fat upon its utilization by guinea pigs, C. M. McCay and H. Paul. (Cornell Univ.). (*Jour. Nutr., 15 (1938), No. 4, pp. 377–382*).—Balance studies were carried out on rats and guinea pigs. The rats, established on a diet of dry skim milk, were given cottonseed oil and hydrogenated cottonseed oil at levels replacing 20 percent of the calories from the milk. Determination of fecal lipid in the two cases indicated that the rat (an omnivorous animal) utilized both fats quite effectively (92.3–96.5 percent utilization of the hydrogenated fat and 96.6–98.5 percent utilization of the oil). The guinea pigs (herbivorous animals), maintained on a diet of alfalfa hay and grain previously extracted with isopropyl ether, were fed the following oils and fats incorporated at a 6-percent level: Castor, soybean, olive, coconut, salmon, cod-liver, neat's-foot, peanut, butter, cottonseed, hydrogenated cottonseed, corn, tallow, and lard. The fecal lipid tended to be much higher after feeding the fats with higher melting points. These fats of higher melting point showed utilizations of 72.0–79.8 percent, whereas the values for the various oils ranged from 86.5 to 96.2 percent.

Nutritional investigations on Bengal fish, K. C. Saha and B. C. Guha (*Indian Jour. Med. Res., 26 (1939), No. 4, pp. 921–927*).—Data on moisture, body fat, ash, protein, total and available iron, calcium, and phosphorus are reported for 24 different varieties of Bengal fresh-water fish designated by native names and in most cases by the zoological name and described as to range of weight and portion analyzed. Methods of sampling and analysis are reported in some detail.

[Composition of turnip greens] (*Miss. Farm Res. [Mississippi Sta.], 2 (1939), No. 10, p. 7*).—Analyses of 10 samples for nutrient constituents are briefly noted.

The defects of tapioca as a staple food, W. R. Aykroyd and B. G. Krishnan (*Indian Jour. Med. Res., 27 (1939), No. 1, pp. 139–145, fig. 1*).—The nutritive value of tapioca as a staple was investigated by the rat-growth method. Young rats fed on a basal diet consisting largely of tapioca, but containing in addition legumes, vegetables, and other foodstuffs in limited amounts corresponding to the usual consumption of poor rice eaters in south India, died within a few weeks. The addition of cod-liver oil or calcium lactate did not affect the survival rate, and a yeast supplement effected only a partial survival. The addition of casein or skim milk, however, permitted survival, and when the supplement amounted to as much as approximately 6 percent of the weight of the basal diet there was an average weekly increase in body weight of about 6 gm. for 10 weeks. A soybean supplement given in such quantity as to supply the same amount of protein as that furnished by the casein supplement was less effective, permitting an average weekly gain of only 1.5 gm. Supplements of soybeans or other legumes furnishing about one-half this amount of proteins produced little growth and did not permit of complete survival. When rice and yams were added to the tapioca diet in proportions typical of diets of certain families in the tapioca-eating district, the animals survived but growth was poor. This diet was also improved by the addition of casein.

The results of these feeding experiments indicate that tapioca as a staple is unsatisfactory because of a deficiency in the quantity and possibly the quality of its protein. The increasing use of tapioca at the expense of other foods, as is typical in certain areas in southwest India, is therefore undesirable from the standpoint of nutrition.

Cooking to conserve minerals, vitamins in vegetables, O. Sheets (*Miss. Farm Res. [Mississippi Sta.], 2 (1939), No. 10, pp. 1, 2*).—The mineral losses

sustained by vegetables cooked by boiling, steaming, and cooking in a pressure cooker were estimated by determining the iron content of peas, beans, and several greens before and after cooking and the iron content of the cooking water. The tabulated results show the greatest losses from long cooking in much water and the smallest losses in steaming or pressure cooking. It is recommended that vegetables (except strong flavored ones) be cooked in a small amount of water for the minimum amount of time to get them tender, and that the cooking water be used either by serving it with the vegetable or in soup. If vitamin C is to be conserved, quick boiling is better than steaming and soda must not be used.

Freezing preservation of foods (*New York State Sta. Rpt. 1939, p. 15*).—This progress report outlines the scope of the research program of the station on the frozen storage of meat and vegetables, including losses of vitamin C.

Effect of dextrose on the freezing of fruits (*Oregon Sta. Bul. 359 (1938), p. 73*).—It is noted briefly that the discoloration of strawberries in freezing storage has been traced to dextrose in too large proportions.

Technical Commission on Nutrition (*League Nations Health Organ. Bul., 7 (1938), No. 4, pp. 666–678*).—Following an introductory section in which a brief summary is given of the current activities of the Technical Commission, this report of a special subcommittee under the chairmanship of E. Mellanby includes an explanation of the steps leading up to the preparation of the monograph by E. J. Bigwood noted below, a summary of nutrition work under the auspices of the commission in the Far East, tropical countries, and colonial territories, and the action taken by the subcommittee on the request from the Health Committee for advice regarding the feeding of refugees. Two schemes for emergency diets for family relief are presented—one for situations where a sufficient supply of dried skim milk powder is available and the other where the skim milk powder must be limited to young children. The allowances are based on whole wheat, skim milk powder, cod-liver oil, and salt for the first scheme and, for the second, whole wheat, skim milk powder, brewers' dried yeast, cod-liver oil, and a salt mixture containing 4 parts of sodium chloride to 1 part of calcium carbonate for growing children and the same without the skim milk powder for adults.

Guiding principles for studies on the nutrition of populations, E. J. Bigwood (*Genève (Geneva): League of Nations, Health Organ., 1939, pp. 281, figs. [11]*).—"The purpose of the present monograph is to indicate what points should be borne in mind in conducting nutrition surveys of populations, in order that the work may be carried out on sound lines and the findings presented in such a way as to facilitate comparison." The material is presented with respect to the two essential aspects of a comprehensive nutrition survey of a population, namely, dietary surveys or investigations of food consumption and inquiries into the state of nutrition of populations, particularly as related to diet.

Under dietary surveys an orientation with regard to the type of survey is followed by a discussion of methods, scope, and duration of the survey, qualifications and size of the investigating staff, the listing and classification of foodstuffs, and finally the analysis of the assembled data in terms of food waste and ultimate contribution to the calorie, protein, mineral, and vitamin needs of the group. Chapters on the economic value of foodstuffs and diets and on statistical considerations are also included. The section on inquiries into the state of nutrition deals with somatometric tests, clinical tests, and physiological tests, including in the latter category specific tests for malnutrition. This material is made more tangible by the presentation of examples of various types of inquiries in a number of countries. A bibliography, a terminological index, record forms for dietary surveys, and height-weight tables are appended.

Nutrition vs. heredity in determining stature (a review), A. S. LEVINE (Mass. Expt. Sta.). (*Growth, 3 (1939), No. 1, pp. 53–59*).—This brief review, covering a number of studies made in America and other countries, points out that hereditary patterns can be modified by conditions of life. Since nutrition is one of the modifying influences, the point is made that it should be possible to improve the physical status of man by dietary measures.

Effect of diet on health (*Miss. Farm Res. [Mississippi Sta.], 2 (1939), No. 10, p. 6*).—Commenting on results of the research work, this article points to the findings that many college girls in the State were somewhat below the *normal minimum for their sex in hemoglobin content and red cell count of the blood, and that iron and copper salts were definitely effective in curing a case of human nutritional anemia.*

A survey of diet and nutrition in Najafgarh, Delhi Province, K. L. SHOURIE (*Indian Jour. Med. Res., 26 (1939), No. 4, pp. 907–920, figs. 2*).—The present investigation is one of a series initiated in 1936 by the Indian Research Fund Association for collecting data on the diet and state of nutrition of population groups in sample areas throughout India. General information is presented on such factors as climate, health status, economic conditions, food supply, and diet, together with more detailed information on the methods employed in the diet surveys and the nature of the groups studied. The diet of 101 families (531 persons) in Najafgarh was studied for a period of about 10 days. In addition, the diet of a district board school hostel was investigated during cool and hot seasons.

The mean intake of various foodstuffs and the calculated intake of calories, protein, fat, calcium, and phosphorus are reported per consumption unit per day for each of the several groups studied, coolies (engaged in road work), agricultural workers, tradesmen, and the school group being represented. A study of these findings indicates that the diets, based on whole cereals and containing some legumes and fair quantities of milk, were satisfactory with regard to calories, protein, calcium, and vitamins A and B_1. The chief deficiency was in *fruits and vegetables, resulting in a very low vitamin C intake (calculated at about 4 mg. per person per day). In the school group little difference was found between the calorie intakes in the hot and the cool seasons.* A parallel examination of 1,483 school children in the district showed that the general condition of the children was good, that signs of deficiency diseases were rare, and that 90–95 percent of the children were free from gross caries and dental irregularities. These findings, coupled with the very low vitamin C intake noted, give no support to the theory that dental caries is related to vitamin C deficiency. The average height of the boys in Najafgarh was similar to that of south Indian boys living on rice staple, but the Najafgarh boys were a little heavier at all ages.

Diet surveys in the Nilgiris and Travancore, B. G. KRISHNAN (*Indian Jour. Med. Res., 26 (1939), No. 4, pp. 901–905, fig. 1*).—This study is another of the diet surveys in sample areas of India, covering the diets of tea plantation workers in the Nilgiris (16 families comprising 90 individuals) and villagers in Travancore (9 families, 47 persons) by food consumption records kept for periods of 7 and 10 days, respectively. The mean intake of various foodstuffs and the calculated intake of calories, proximate principles, calcium, and phosphorus are reported per consumption unit per day for each of these groups.

Both groups consumed an unsatisfactory diet. In the Nilgiris area, where rice contributed about 82 percent of the calorie intake and the consumption of leafy vegetables and milk was exceedingly low, the calcium was noticeably low (average 0.19 gm. per person per day). In the Travancore group tapioca was an important ingredient of the diet, and this was reflected in the low protein

intake (average 0.32 gm. per person per day). To this protein insufficiency is ascribed the stunting of growth noted in the boys and girls of this district. These children were found to be smaller and lighter than children in other parts of south India living on a rice staple.

Studies on basal metabolism in Bombay, I, S. P. Niyogi, V. N. Patwardhan, and J. Mordecai (*Indian Jour. Med. Res.*, 27 (1939), No. 1, pp. 99–113).—This is one of a series of studies undertaken to establish standards of basal metabolism for people residing in different parts of India and to determine the relative importance of different factors (dietetic, climatic, occupational, etc.) influencing metabolism. The basal metabolism of 24 men and 52 women between the ages of 18 and 35 yr. was measured by the Sanborn graphic metabolic tester. Each subject was tested on 3 days, 3 observations being made on each day. The mean of the lowest 2 observations on the second and third days was taken as the true basal metabolism of the subject. On this basis the average oxygen consumption for the men and the women, respectively, was 187 and 152 cc. per minute. For these 2 groups, respectively, the values for heat production were 34.5 and 32.05 calories per square meter per hour. These values are all low, as judged by various American standards (Mayo Clinic, Harris-Benedict, and Aub and DuBois), but the authors point out that this is not necessarily a racial difference, since diet, climate, and other factors which differ widely in the 2 regions also affect the metabolic rate. On the basis of the results reported, the total caloric requirements of men and women in Bombay are calculated at approximately 2,604 and 1,875 calories per day, respectively.

Studies in human metabolism.—I, Protein metabolism in Indians, K. P. Basu and M. N. Basak (*Indian Jour. Med. Res.*, 27 (1939), No. 1, pp. 115–134).—The present investigation was undertaken with natives of India, two adult males (each weighing 49 kg.) serving as subjects. The minimum nitrogen excretion on a protein-free diet was found to be 0.05 and 0.07 gm. of nitrogen per kilogram body weight for these subjects, respectively. The actual eliminations (averages for the last 3 days of a 6-day test period) amounted to 1.499 and 2.302 gm. in the urine and 0.946 and 1.133 gm. in the feces. On diets consisting mainly of rice but containing also some legumes and vegetables, the average minimum protein requirements for maintenance, calculated per 70 kg. of body weight, were determined as 37.5 and 53.6 gm. for the two subjects. On similar diets in which wheat predominated, the maintenance protein requirements were 34.7 and 60 gm. Out of 30 metabolism experiments the average protein requirement from 10 experiments in which nitrogen balance was nearly obtained was found to be 46.4 gm. of protein per 70 kg. of body weight. These rice and wheat diets resembled those consumed by poor Indian natives, and the authors conclude, therefore, that such diets without any milk are capable of maintaining adults in nitrogen balance. The typical rice diet did not contain the allowance of 50 percent above the maintenance level, whereas the wheat diet did contain this allowance. It was found that the retention of protein was greater on the diet largely composed of whole wheat than it was on the diet of equal calorie value containing similar quantities of rice. In a series of experiments in which wheat or rice diets were supplemented with increasing quantities of sugar so that the total calorie intake was gradually increased from 3,000 to 4,000 calories, the increased energy value exerted a protein-sparing action and effected better nitrogen retention.

A consideration of quantitative relations between erythrocytes, leucocytes, and hemoglobin of the blood, B. M. Hamil, M. W. Poole, B. Munday, M. L. Shepherd, L. Emerson, I. G. Macy, and T. E. Raiford (*Jour. Lab. and Clin. Med.*, 23 (1938), No. 5, pp. 488–496).—The data from 1,644 simultaneous determinations of hemoglobin, red blood cell, and white blood cell counts on

364 well infants are presented in three correlation tables for erythrocyte-hemoglobin, hemoglobin-leucocyte, and erythrocyte-leucocyte components, respectively. Statistical analysis of the data from these tables establishes that quantitatively the hemoglobin, red blood cell, and white blood cell counts are independent of one another within certain limits. "Although a rise in erythrocytes is usually accompanied by a slight rise in hemoglobin, a knowledge of the red cell count is of little value in estimating the actual hemoglobin level. Similarly, if one knows the hemoglobin value, it is not possible to predict what the red cell count will be, nor will a white cell count be of any value in gaging the number of red blood cells, or vice versa." It is also stated that these results are corroborated by a separate study of 206 blood determinations from 11 adult women.

Further studies on the unsaturated fatty acids essential in nutrition, O. Turpeinen. (Univ. Calif.). (*Jour. Nutr., 15 (1938), No. 4, pp. 351–366, figs. 6*).—Tests for their effectiveness in curing the "fat deficiency" syndrome produced in rats by diets rigidly devoid of fat were made for the first time with erucic acid, ricinoleic acid, $\Delta^{11:12}$-oleic acid, and chaulmoogric acid fed in the form of their methyl or ethyl esters and linoleyl alcohol. The acids all proved ineffective in relieving the fat deficiency symptoms, but linoleyl alcohol showed some curative properties, although it was less effective than linoleic acid.

Linoleic acid fed daily at 25-, 50-, 100-, and 200-mg. levels gave maximum growth response at the 100-mg. level, no other improvement in growth being obtained with twice this amount. Arachidonic acid fed as the methyl ester gave maximal growth response at only a 33-mg. level and in this respect was definitely superior to linoleic acid. Because of this superiority as a curative agent and its wide occurrence in physiologically important phospholipids, it is suggested tentatively that the need of the animal body may be primarily for arachidonic acid. Linoleic acid and other effective substances may be beneficial because of their conversion into this acid in the body.

The influence of varying levels of calcium intake on the biological value of proteins, M. Swaminathan (*Indian Jour. Med. Res., 27 (1939), No. 1, pp. 147–152*).—The biological value of a mixture of casein and rice proteins, fed at a combined level of about 10 percent, was determined by the nitrogen balance method for maintenance of nitrogen equilibrium, using adult rats, and also by the growth method, using young rats. The basal diet containing 0.011 percent of calcium was varied with calcium lactate supplements so that the calcium content of the diets ranged from 0.036 to 0.4 percent. The results indicated that the biological value of the protein mixture was not affected by changes in the calcium content of the series of experimental diets.

On copper content of foods, S. C. Choudhury and U. P. Basu (*Indian Jour. Med. Res., 26 (1939), No. 4, pp. 929–934*).—Data are reported for the copper content of about 45 cereals, legumes, and other Indian foodstuffs, including a few fish. The results obtained, chiefly by the Biazzo method, indicate that nuts, legumes, cereals, and fish contain the highest amount, whereas milk is low in copper. The authors consider it improbable that there is any serious copper deficiency in any Indian adult mixed diet, but that it may be desirable to enrich infant diets with a trace of copper salt.

A quantitative study, by means of spectrographic analysis, of copper in nutrition, F. I. Scoular (*Jour. Nutr., 16 (1938), No. 5, pp. 437–450, figs. 2*).—Copper retentions were determined for three normal boys ranging in age from 3 to 6 yr. The subjects were studied in six successive double metabolism periods, as described by Daniels et al. (E. S. R., 74, p. 130), a total of 35 copper balance studies having been carried out. Food, feces, and urine were analyzed

by a spectrographic procedure, the spectra of the ash in the various cases being compared with spectra produced by solutions of known copper content.

The daily urinary copper excretion for any given child was fairly constant, averaging about 4 percent of the ingested copper. From 15 to 58 percent of the ingested copper was excreted by way of the alimentary tract. "The lowest copper retentions occurred with the lowest copper intakes, while the highest retention, 0.058 mg., was obtained with an ingestion which was close to the maximum level of copper consumed, namely, 0.084 mg. per kilogram of body weight. Since higher retentions did not occur with the higher ingestions tested, it is concluded that between 0.053 and 0.085 mg. of copper per kilogram of weight are required by boys between the ages of 3 and 6 yr."

The nutritional availability of iron in molasses, R. S. Harris, L. M. Mosher, and J. W. M. Bunker (*Amer. Jour. Digest. Diseases, 6 (1939), No. 7, pp. 459-462*).—Three grades of molasses (first, second, and third) were analyzed for total and available iron, total iron being determined on the ashed samples by the dipyridyl method and available iron by the modified dipyridyl method of Kohler, Elvehjem, and Hart (E. S. R., 75, p. 743). The availability was also determined biologically, using the rat as a test animal and employing 35-day test periods. In one series of experiments the response of animals receiving daily doses of 0.15 mg. of molasses iron was compared with that of animals receiving similar doses of medicinal iron from ferric chloride. In a second series the level of molasses iron required to produce a hemoglobin response similar to that produced by 0.15 mg. of ferric chloride iron daily was determined. By the chemical procedure total iron was found to be 3.2 ± 0.2, 6.0 ± 0.5, and 11.3 ± 0.6 mg. per 100 gm. in the three grades, respectively. The corresponding values for available iron were 3.1 ± 0.1, 5.1 ± 0.2, and 6.1 ± 0.3, representing an availability of 97, 85, and 54 percent, respectively. Although the iron in the low-grade molasses was found to be less available than in the higher grades, this was more than offset by the higher percentage of total iron. The results of the several determinations indicate that the dipyridyl procedure is acceptable for the determination of available iron in molasses. The findings indicate further that molasses, which is inexpensive, is a rich source of available iron.

The absorption and excretion of iron following oral and intravenous administration, R. A. McCance and E. M. Widdowson (*Jour. Physiol., 94 (1938), No. 1, pp. 148-154*).—To test the authors' theory (E. S. R., 79, p. 134) that the capacity of the body to excrete iron is negligible, metabolism studies were conducted on three male and three female adult subjects. All of these were in good health throughout the experiment, which consisted of 3 phases, each of which included 2 or 3 preliminary days, 14 experimental days divided into 2 periods, and 1 or 2 concluding days.

In the first phase the only source of iron was the food, which furnished from 5.9 to 8.6 mg. of iron per person daily. On this amount the balances were positive with two exceptions (−8.1 and −15.1), with a total average for the entire period of +11.5 mg. on a total intake of 603.3 mg.

In the second phase the oral intakes were increased to from 12 to 16 mg. per day by supplements of a ferric ammonium citrate made up in solution with salts of magnesium, potassium, and zinc included as part of another study. On the higher intakes of iron the small output in the urine was not changed significantly. The output in the feces rose to an amount practically equaling the intake. Four of the balances were positive and two negative, the total average being +27.6 mg. on a total iron intake of 1,160.3 mg.

In the third phase 7 mg. of iron in an ammonium citrate preparation was injected intravenously in combination with calcium, magnesium, and zinc salts.

The intake by mouth from food sources amounted to from 7.6 to 11.7 mg. per subject. On this higher dosage of iron the excretion in the urine was about twice that of the first two periods, but amounted to only 1.4 percent of the quantity injected. The iron in the feces was again practically the same as in the food. The balances, if injected iron was not considered, were negative in 5 and positive in 2 cases, with a total average of −15.6 mg. on an intake of 86.6 mg. Correcting this value for urinary iron, the group balance became [illegible] mg. Including the injected iron, the balances were in all cases positive, with a total average of 574.4 mg.

These results are thought to demonstrate that none of the injected iron was excreted by the gastrointestinal tract and to confirm the theory that the intestine has no power of regulating by excretion the amount of iron in the body.

The comparative toxicity of fluorine in calcium fluoride and in cryolite, M. LAWRENZ, H. H. MITCHELL, and W. A. RUTH. (Univ. Ill.) (*Jour. Nutr., 18 (1939), No. 2, pp. 115–125*).—Young albino rats, fed individually by the paired-feeding technic on a basal diet containing 3.04 p. p. m. of fluorine, were given additional fluorine, administered in the drinking water as calcium fluoride in one group and in the paired group in similar concentration as cryolite. The total intake of fluorine averaged 0.75 mg. per kilogram of body weight, 77 percent being contained in the drinking water and 23 percent in the basal diet. At the end of the feeding period (95–105 days) the soft tissues, skeleton, and teeth were analyzed separately for fluorine content. Although none of the animals made pronounced weight gains, due probably to the rigorous conditions of the experiment, still the fluorine in the cryolite appeared no more toxic than that in the calcium fluoride, nor was the cryolite fluorine retained in the body to any greater extent. The appearance of striations in the incisor teeth was equally rapid with both fluorine compounds. About 96 percent of the fluorine retained at this intake (equivalent to 13 p. p. m. of the food consumed) was deposited in the skeleton and the remaining 4 percent was about equally divided between the teeth and soft tissues.

Average values for basal respiratory functions in adolescents and adults, N. W. SHOCK and M. H. SOLEY. (Univ. Calif.). (*Jour. Nutr., 18 (1939), No. 2, pp. 143–153*).—Data are reported by age groups for the respiratory rate, the respiratory volume per minute, the tidal volume, the oxygen and carbon dioxide concentrations in the expired air, and the oxygen consumption and alveolar carbon dioxide tension as determined on 50 male and 50 female adolescents and 16 male and 40 female adults. The authors consider that the data indicate growth changes over the adolescent period in certain respiratory functions, such as carbon dioxide and oxygen content of expired air, alveolar carbon dioxide tension, and tidal volume.

Problems of ageing: Biological and medical aspects, edited by E. V. COWDRY (*Baltimore: Williams & Wilkins Co., 1939, pp. XXX+758, figs. 121*).—This volume, a publication of The Josiah Macy, Jr., Foundation, sets forth the experience and points of view of many specialists in different fields who have reviewed the literature and also presented their own findings on the process of ageing. From the standpoint of nutrition implications, the following chapters are of interest: Digestive System, by A. C. Ivy; Skeleton, Locomotor System, and Teeth, by T. Wingate Todd; The Thyroid, Pancreatic Islets, Parathyroids, Adrenals, Thymus, and Pituitary, by A. J. Carlson; and Chemical Aspects of Ageing, by C. M. McCay.

Body size and energy metabolism in growth hormone rats, M. KLEIBER and H. H. COLE. (Univ. Calif.). (*Amer. Jour. Physiol., 125 (1939), No. 4, pp. 747–760, figs. 2*).—This investigation was undertaken to obtain evidence that

would indicate whether the metabolic rate of an animal is a result of somatogenic adaptation to a condition of its body as a whole, such as its body size, or is a genetically fixed characteristic of its tissues. The metabolic rates of 22 female rats made giant by intraperitoneal injections, over a period of 6 mo., of a growth-promoting pituitary extract (designated as "growth hormone") were compared with those of normal-sized litter mate controls. The data on fasting catabolism were obtained in respiration trials of 4 hours' duration during the period of injections and also after the cessation of injections, 127 trials being made on injected rats and 118 on the controls. These data were supplemented by measurements of oxygen consumption of the surviving diaphragms in vitro after the rats had been killed. The rats that were sacrificed were subjected to certain anatomical measurements and then to chemical analysis.

Growth was slightly hypergonic for the skin, slightly hypogonic for the liver, and significantly hypogonic for the heart. The thyroid glands of the injected rats were relatively smaller and the adrenals absolutely smaller than the corresponding glands of the controls. The metabolic rate of the injected rats was consistently and significantly lower than the corresponding rate of the controls. These differences in metabolic rates between giant rats and litter mate controls were not due to genetic differences and cannot be explained by changes in body composition, since the two groups were not significantly different in protein, fat, and water content of the bodies. The abnormally low metabolic rate of the giant rats is assumed to reflect the activity of the thyroid glands, the activity having been appreciably decreased by the chronic injections of pituitary extract. The rate of oxygen consumption per unit of dry weight of tissue in vitro was smaller in the diaphragms of the injected rats than in the control diaphragms, indicating that the respiration of tissue in vitro is still affected by the previous condition of the animal. The authors interpret their results "as an example of somatic adaptation of tissue metabolism in vivo as well as in vitro to a condition of the animal as a whole, particularly to its endocrine system, which is in correlation to body size."

An X-ray densitometer for measuring relative densities of muscle, bone and other tissues, H. E. WEBBER (*Science, 90 (1939), No. 2327, pp. 115, 116, fig. 1*).—The instrument is described briefly and illustrated by diagram. In using the instrument, a calibration table permits relative tissue density values, based on absolute film density values, to be noted at a glance for each millimeter of galvanometer deflection. The total range of the instrument in units of film density is from 0.3 to 3.0.

The status of certain questions concerning vitamins based on recommendation of the cooperative committee on vitamins, P. N. LEECH, F. C. BING, ET AL. (*Jour. Amer. Med. Assoc., 113 (1939), No. 7, pp. 589–595*).—This report, authorized by the Council on Pharmacy and Chemistry and the Council on Foods of the American Medical Association, contains revised statements on permissible claims for vitamin A, riboflavin, thiamin (thiamin chloride), nicotinic acid (amide), ascorbic acid, vitamin D, and vitamin A and D preparations, together with brief statements concerning the scientific evidence on which the claims are based. Recent questions concerning the fortification of foods with vitamins are also considered. It is the policy to discourage the general and indiscriminate fortification of foods with vitamins, although the restorative addition of vitamins or minerals within certain limits is not necessarily discouraged. Although it is recognized that polyvitamin mixtures may have a limited use, the stand is taken that they cannot replace the need for adequate amounts of a well-balanced diet and that their use is no assurance of "good health."

Further studies on the vitamin A and C content of Washington grown apples, E. N. TODHUNTER (*Washington Sta. Bul. 375 (1939), pp. 24*).—In extension of earlier work on the vitamin A and C content of Washington-grown apples as summarized in Popular Bulletin 152 (E. S. R., 79, p. 130), this report deals with further studies conducted over a period of 4 yr. of the factors that may influence the content of these vitamins in apples. Both biological and chemical tests were employed for vitamin C and biological tests with and without the use of a standard of reference for vitamin A.

Winesap apples from plats receiving added fertilizers of nitrogen, phosphorus, and potassium showed no higher content of vitamin C or nitrogen during two seasons than fruit of the same variety receiving no added fertilizer. In biological tests with highly colored and poorly colored apples from the same trees of the Jonathan and Delicious varieties, there was some indication that the more highly colored fruit may have been slightly richer in vitamin C than the poorly colored, but the differences were too small to be measured accurately by the biological method.

In varietal studies Esopus (Spitzenburg) gave a vitamin C value of 2 International Units per gram, Winter Banana 1, Stayman Winesap 0.9, and White Pearmain 0.6 I. U. per gram. These values correspond to 10, 5, 4.5, and 3 mg. of ascorbic acid per 100 gm. The distribution of vitamin C in different parts of the apple was tested on the Winter Banana variety, with the following results: Peel 14.8, flesh at calyx end 5.4, flesh at stem end 4.8, whole apple 4.9, flesh only of the whole apple 4, flesh next to the peel 4.3, flesh next to the core 3.1, and middle section of the flesh 2.5 mg. per 100 gm.

The possible effect of irrigation on the vitamin C content was tested on two plats, one receiving 30 and the other 60 acre-in. of water per season. In 10 samples of Rome Beauty the ascorbic acid content ranged from 1.8 to 5.4, with an average of 3.6 mg. per 100 gm., for the plat receiving the smaller amount of irrigation and from 3 to 7.2, with an average of 4.2 mg. per 100 gm., for the plat receiving the larger amount. In the two groups of Winesap apples the corresponding values were 3, 3.4, and 3.2 and 3.6, 5.3, and 4.8 mg. per 100 gm., respectively.

The peel of the Richared apple was found to contain at least 5 times as much vitamin A as the flesh, the corresponding values estimated in Sherman units being 5 and between 18.7 and 37.5 units per 100 gm. The vitamin A content of Delicious apples was determined by the method of the U. S. P. XI, with the use of cod-liver oil of known vitamin A content as a standard of reference and found to be more than 102 I. U. per 100 gm.

The occurrence and magnitude of actual vitamin A deficiencies [trans. title], W. v. DRIGALSKI, H. KUNZ, and K. SCHLÜPMANN (*Klin. Wchnschr., 18 (1939), No. 25, pp. 875–877*).—Tests for vitamin A deficiency were made on numerous subjects (German), including healthy adults, various pathological cases, and pregnant and lactating women. The Birch-Hirschfeld adaptometer was used, employing the technic of Jeans and Zentmire (E. S. R., 71, p. 566). Certain deficiency cases required the administration of from 72,000 to 300,000 International Units of vitamin A to restore the level to normal. The authors conclude that there is a wide spread between minimum and optimum vitamin A requirements.

Early lesions of vitamin A deficiency, J. T. IRVING and M. B. RICHARDS (*Jour. Physiol., 94 (1938), No. 3, pp. 307–321, pl. 1*).—Albino or hooded rats bred from stock were placed at weaning on a vitamin A-free diet, killed at definite intervals of time regardless of their clinical condition, and their central nervous

systems examined by the Marchi method for degeneration. Litter mates on the same diet supplemented with vitamin A or carotene were used as controls. Special care was taken in dissection to prevent damage to the tissues.

Of 141 rats on the vitamin A-free diet, 108 showed degenerative changes in the same part of the medulla, the exceptions being animals killed at too early an age to show the development of lesions. No lesions were found in the controls. The correlation between degree of degeneration and length of time on the diet was extremely close. Lesions developed earlier in animals kept from access to the mother's diet before weaning than in those allowed access to it and earlier in males than females. Many of the animals showed marked nerve lesions at a stage when they were still increasing in weight and were apparently in good health. This finding agrees with the conclusion of Richards and Simpson (E. S. R., 73, p. 721) that weight curves are not a reliable index of vitamin A depletion. The early appearance of nerve lesions in these experimental animals and the results of night-blindness tests in human beings are thought to suggest that a relative lack of vitamin A may be widespread, although undetected by ordinary clinical methods.

The vitamin B_1 content of foods.—II, Additional values, A. Z. Baker and M. D. Wright (*Biochem. Jour., 32 (1938), No. 12, pp. 2156–2161, figs. 4*).—In continuation of a previous study (E. S. R., 76, p. 132), vitamin B_1 values expressed as International Units per gram are reported for numerous foods, including raw and cooked meats, fish, sweetened condensed milk, raw and cooked vegetables and fruits, cereals and farinaceous products, molasses, and several breads (the latter quoted from a previous study). The foods were assayed by the rat-bradycardia method. In commenting on the method, the authors indicate that they have found it sensitive, and that it offers no particular difficulties.

Vitamin B_1 content of human milk as affected by ingestion of thiamin chloride, A. F. Morgan and E. G. Haynes. (Univ. Calif.). (*Jour. Nutr., 18 (1939), No. 2, pp. 105–114*).—Two healthy young women on diets differing appreciably in vitamin B_1 content served as subjects. Records were kept of the food consumed, the total milk production was estimated, and the vitamin B_1 content of the milks was determined by biological assay, using the method of rat growth after preliminary depletion. After the first month of the test, when the subjects received, respectively, a daily average of about 1,650 and 1,050 μg. of vitamin B_1 of dietary origin, the milks secreted had respective vitamin B_1 potencies of 32 and 11 μg. per 100 gm. During a second test month, when each of the subjects took 5 mg. of thiamin chloride daily and the dietary intakes were adjusted somewhat so that they averaged 1,150 and 1,140 μg. daily, there was no change in the vitamin B_1 content of the milk of the higher potency but an increase was noted in that of lower potency to a new level of 20 μg. per 100 gm. During the third experimental period the first subject received daily for a month a supplement of 10 mg. of thiamin chloride and the second received 14.2 mg., the daily dietary intakes being 1,250 and 1,060 μg., respectively, and the new levels for the milk 25 and 25 μg. per 100 gm. Three assays of market samples of cow's milk showed 27, 30, and 32 μg. per 100 gm.

"It is concluded that the level of vitamin B_1 in human milk is controlled in the lower brackets by the vitamin B_1 content of the diet, but that, as in cow's milk, a maximum level exists above which the vitamin content cannot be raised even by massive doses of thiamin chloride. This maximum level appears to be the same in human and cow's milk, 25 to 32 μg. per 100 gm. of milk."

***Role of vitamin B in resistance*, D. Perla** (*Arch. Pathol., 25 (1938), Nos. 4, pp. 539–568; 5, pp. 694–729*).—This extensive review, similar to the earlier one on vitamin C (E. S. R., 78, p. 572), considers the effect of a deficiency of vitamin B

complex) on the formation of natural and acquired antibodies, on anaphylaxis, and on natural resistance to spontaneous and induced infections and to poisons and toxins. The effect of an excess of vitamin B is considered from the standpoint of the natural resistance of animals to experimental infection and of the natural resistance of man and the therapeutic use of this vitamin complex. The importance of vitamin B_2 in metabolism and resistance and the role of vitamins B_1 and B_2 in natural resistance are also discussed. The literature references, totaling 166, are given as footnotes.

The excretion of vitamin B_1 in the urine and feces, R. F. Light, A. S. Schultz, L. Atkin, and L. J. Cracas (*Jour. Nutr., 16 (1938), No. 4, pp. 333–344*).—In metabolism tests with rats receiving a basal diet deficient in vitamin B_1 but adequate in other respects, the vitamin B_1 elimination, determined by the fermentation method of Shultz, Atkin, and Frey (E. S. R., 79, p. 11), was followed as the body of the animal adjusted to progressively increasing intake levels of the vitamin fed as supplements in the form of a 20-percent solution of the crystalline synthetic vitamin. In every instance as the intake was held constant at a given level, the body adjusted to a constant output. Excretion equilibrium was established repeatedly as the vitamin B_1 intakes (oral) were stepped up from 15γ to 40γ, 65γ, 115γ, 215γ, and 515γ. Animals on the low levels of vitamin intake showed a time lag before reaching excretion equilibrium, but at intake levels between 50γ and 65γ and above excretion equilibrium was attained promptly. Apparently, therefore, little or no further storage took place once the animal had reached excretion equilibrium at some level between 40γ and 65γ. Throughout the range of intake, the ingested vitamin showed the following distribution: 25–35 percent excreted via urine, 20–30 percent via feces, and the remainder unaccounted for. When the rats received from 200γ to 500γ of the vitamin daily by injection, from 75 to 85 percent of it was excreted via the urine. Ten-kg. dogs, however, showed a urinary excretion of only 50 percent of injected doses of 2,000γ.

The urinary elimination of large doses of aneurin (vitamin B_1) administered by subcutaneous injection [trans. title], F. Sciclounoff (*Compt. Rend. Soc. Biol. [Paris], 131 (1939), No. 15, pp. 53, 54*).—The few data presented on the urinary elimination of vitamin B_1 are interpreted to indicate that there is no parallel between the doses administered and the amount eliminated. According to the results obtained there was an elimination of approximately 15–38 percent of the amounts injected regardless of whether the doses were small (4 mg.) or large (50 mg.). In the few subjects receiving daily injections of 50 mg. of the vitamin, the maximum elimination tended to occur on the second or third day, leveling off at this point except for certain sharp declines which were temporary and unexplainable. After cessation of injections, urinary elimination of the vitamin was maintained for approximately a week at about 4 or 5 times the normal level. This apparent production of tissue saturation by the injection of large doses of vitamin B_1 is considered to have clinical significance.

The growth-promoting action of adermin in the case of the rat [trans. title], R. Kuhn and G. Wendt (*Hoppe-Seyler's Ztschr. Physiol. Chem., 256 (1938), No. 2–3, pp. 127–130, figs. 4*).—Two series of rats were placed on basic diets high in carbohydrate, rice starch being used in one case and cane sugar in the other. Casein (triple extracted), butterfat, cod-liver oil, and a balanced salt mixture in stated proportions were also components of these basic diets, which were eaten ad libitum. From the beginning of the experiment each rat received daily supplements of 20γ of aneurin (thiamin) chloride (as the hydrochloride), 10γ of lactoflavin, and 0.5 cc. of the "filtrate factor" almost completely freed of vitamin B_6 and containing less than 0.5γ of adermin. After

development of the dermatitis, adermin hydrochloride, $C_8H_{11}O_3N.HCl$, (m. p. 204°–205° [C.]) was given in daily supplements of 10γ, 7.5γ, 5γ, and 2.5γ, respectively. At the first three levels complete healing of the acrodynia occurred in 21, 21, and 30 days, respectively. At the low level healing did not occur during the experiment. In this period the corresponding growth increments in grams per day were 1.04, 0.92, 0.82, and 0.61. These results were considered comparable to those of other investigators whose findings were discussed.

Investigations on the relation between intake and excretion of aneurin in the case of normal subjects and pregnant women, H. G. K. Westenbrink and J. Goudsmit (*Arch. Néerland. Physiol. Homme et Anim., 23 (1938), No. 1, pp. 79–96*).—The method used for determining aneurin in the urine is outlined, this being essentially a modification of the Jansen thiochrome method. The fluorometer employed is constructed with a high-deflection galvanometer which serves to increase the sensitivity, though not the accuracy, of the method. Six cc. of urine are sufficient for carrying out the procedure.

Experiments are described which are interpreted to indicate that subjects with an average spontaneous excretion of 100 μg. or more of aneurin are saturated. Results are given to show that a larger percentage of orally administered aneurin is excreted when the amount is given in several small doses than in a single large dose. Other data indicate that with the large doses of aneurin the excretion is greater after intramuscular injection than after oral administration of the same dose. The difference increased with increasing doses, but was noted only in the first hour after the injection, from which it is concluded that injection effects a temporary abnormally high concentration of aneurin in the blood. Saturation tests, therefore, should be carried out by giving the aneurin by mouth and not parenterally.

Pregnant women from the poorer sections of Amsterdam were found to excrete little or no aneurin in the 24-hr. period following a 5-mg. injection of the vitamin. Nonpregnant women from the same section averaged a 40-μg. excretion in the next 24 hr. Following a second 5-mg. oral dose, one group of the pregnant women still excreted no aneurin, another group excreted from 30 to 320 μg., and the few who had shown slight excretion on the first day excreted from 120 to 500 μg. after the second dose. Nonpregnant women on the other hand excreted from 30 to 650 μg. (average 260) in the 24 hr. following the second test dose. The pregnant women were carried on the aneurin dosage for several days longer, during which time some of them still showed no urinary excretion. Apparently pregnancy had a distinct influence on the excretion of aneurin, and with few exceptions the pregnant women studied were far from saturated with the vitamin.

Study of normal animal organs and vitamin B_1 avitaminosis by means of the Phycomyces test.—Establishment of a micromethod [trans. title], W. H. Schopfer and A. Jung (*Ztschr. Vitaminforsch., 7 (1938), No. 2, pp. 143–152, figs. 2; Fr., Ger., Eng. abs., p. 151*).—The test depends upon the fact that *P. blakesleeanus* does not develop in a synthetic medium except in the presence of aneurin or its constituents 2-methyl-4-amino-5-amino-methyl-pyrimidine and 4-methyl-5-(β-oxyethyl)-thiazol. In case of an unknown the test may be made specific for aneurin by employing a fuller's earth adsorbate which is selective for the aneurin. *Phycomyces*, whose development in culture is not affected by the number (within certain limits) of spores inoculated, furnishes a homogeneous thallus, which is easily separated and weighed. In the method originally proposed (E. S. R., 78, p. 725), growth was measured by weighing the fungus, the growth curves obtained with various concentrations of the unknown being compared with those yielded by standard solutions of the vitamin. The discovery that asparagine as a source of nitrogen greatly stimulates the growth

activity of *Phycomyces* made possible the present micromodification. By the micromethod 1 percent of asparagine is incorporated in the synthetic medium, which is placed in 1- or 3-cc. portions in glass cylinders of 12- or 30-mm. diameter, respectively, and inoculated. Effective cultures are obtained and the yield is estimated, not by weighing, but by measuring the height of mycelium development in the tubes.

Results obtained by various workers in the application of the test to various substances are discussed, and the authors present their own findings, indicating that there is a pronounced decrease in the aneurin content of the organs of rats suffering from vitamin B_1 avitaminosis. The adoption of a *Phycomyces* unit is proposed, this unit to correspond to the quantity of aneurin necessary to obtain 5 mg. of the dry fungus under well-defined optimal cultural conditions. It is equivalent to 0.025γ of crystalline aneurin. One International Unit would thus correspond to 100 *Phycomyces* units.

Deficiency of vitamin B_2, J. V. Landor (*Lancet* [*London*], *1939, I, No. 24, pp. 1368–1370*).—Cases of eczema of the scrotum and stomatitis occurring in a Singapore jail were not cured by nicotinic acid, but yeast or marmite effected a ready cure. These cases, though presenting pellagrous symptoms, were considered distinct from classical pellagra and as due to "a deficiency of a portion of the vitamin B_2 complex which is not nicotinic acid." A case of classical pellagra, however, was dramatically cured by nicotinic acid.

Vitamin-C content of the chillies, onion, and garlic, both in the raw state and when boiled with water, H. G. Biswas and K. L. Das (*Indian Jour. Med. Res., 27 (1939), No. 1, pp. 135–138*).—A dichlorophenolindophenol titration technic was used to determine ascorbic acid in three varieties of onion (*Allium cepa*), the onion scape, and garlic (*A. sativa*) in both the fresh and cooked state. Cooking was accomplished by boiling 10 gm. of the fresh vegetable with 150 cc. of distilled water for 15 min., the added water being just evaporated in this time. For these five items, respectively, the ascorbic acid content of the fresh vegetable averaged 8.6, 7.2, 6.6, 10.6, and 7.0 mg. per 100 gm., each average being based on analyses of three market samples obtained at different dates. Upon boiling, however, there was a loss in vitamin C, the corresponding values in the cooked state being 3.0, 2.5, 1.9, 6.2, and 3.2 mg. per 100 gm.

Three varieties of chilies (*Capsicum*) in both the unripe and ripe stage of maturity were similarly analyzed, the unripe samples averaging 19.4, 9.9, and 80.5 mg. per 100 gm. in the fresh state and 150.2, 105.3, and 152.8 mg. per 100 gm. when boiled. Upon ripening there was also an increase in ascorbic acid, 174.9, 138.9, and 171.7 being the corresponding averages obtained for the ripe uncooked samples. The ripe chilies when boiled likewise increased in ascorbic acid content, 224.1, 158.1, and 210.0 mg. per 100 gm., respectively, being the amounts found in the cooked samples. The authors ascribe the increase in vitamin in the ripening process to the liberation of ascorbic acid from its combined or ester form under the influence of enzyme activity. They consider further that the increase noted in the cooked vegetable may be attributed to the action of heat in effecting a break-down of the ester and in softening the tissues, thereby permitting more complete extraction of the vitamin. Since the tissues of the ripe chilies are softened in the ripening process, the difference between cooked and uncooked samples is less marked than in the case of unripe chilies.

What does an intracutaneous test with indophenol accomplish in the test for the vitamin C status? [trans. title] H. Beck and F. H. Krieger (*Deut. Med. Wchnschr., 65 (1939), No. 34, pp. 1336–1340, figs. 3*).—In the test described a 0.0025 M solution of dichlorophenolindophenol is injected intracu-

taneously, and the rate of decolorization of the dye in the resulting wheal is taken as a measure of the vitamin C saturation of the tissue. Tests on 62 healthy individuals on a normal, well-rounded diet showed decolorizing times varying from 5 to 16 min., 72 percent of the cases falling within the limits of 8–12 min., and the group as a whole averaging about 10 min. Patients in another group were given daily doses of 300 mg. of ascorbic acid until the urinary elimination indicated tissue saturation. The wheal test applied at this time gave further indication that a range of 10–12 min. for the decolorizing time was representative for individuals with satisfactory vitamin C stores.

The test applied to 52 patients with diseases in which no vitamin C deficiency would be expected showed that 81 percent of them gave decolorizing times within the normal limits of 10–12 min. Another group of 40 patients, including those with pneumonia, pleurisy, tuberculosis, and chronic gastritis following stomach resection, conditions in which vitamin C hypovitaminosis would be expected, showed prolonged decolorizing periods, 92.5 percent being above the 12-min. period and the average being 18.6 min. In investigations with newborn infants and their mothers who had been on a vitamin C-rich diet, the results showed 7–15 min. for the mothers, 6–12 min. for the infants. The authors consider that the intracutaneous test described is satisfactory for clinical purposes.

Investigations on vitamin C deficiency among pellagrins by the saturation test [trans. title], I. CLAUDIAN and A. GHERMANI (*Compt. Rend. Soc. Biol.* [*Paris*], *129* (*1938*), *No. 35*, *pp. 999–1003*).—In these studies, carried out in Rumania, the method of Harris and Ray (E. S. R., 73, p. 427) was employed. The results indicated the existence of very pronounced vitamin C deficiency in hospitalized pellagrins maintained on the hospital diet for these patients. Similar low values were also found among some of the people in certain country areas after the limited dietary regime of the winter and spring. Clinical symptoms of the deficiency were not always evident in these cases, however, even though the elimination values were very low. Most subjects responded favorably to an improved dietary regime, although in severe cases of pellagra there was no improvement, due apparently to defective assimilation of the vitamin.

A study of the ascorbic acid intake required to maintain tissue saturation in normal adults, W. B. BELSER, H. M. HAUCK, and C. A. STORVICK. (Cornell Univ.). (*Jour. Nutr.*, *17* (*1939*), *No. 6*, *pp. 513–526*, *fig. 1*).—Seven normal adults, five women and two men, served as subjects in a series of experiments undertaken to determine the minimum intake of ascorbic acid necessary to maintain the body tissues in a fully saturated state with respect to vitamin C. The basal diet used was a modification of the one described in a previous report by O'Hara and Hauck (E. S. R., 77, p. 572) and furnished approximately 10 mg. of vitamin C daily. The additional vitamin C was given as synthetic ascorbic acid, which was dissolved in a little water and taken daily at breakfast. The 400 mg. test dose used to determine saturation was divided equally between morning and noon meals. The general plan of the experiment was, first, to saturate the subjects by giving them large doses of vitamin C in the form of the juice of from 4 to 8 oranges daily for 3 days in addition to the usual diet. The 24-hr. urine was collected and titrated on the day preceding the experimental period, and in the majority of cases the ascorbic acid excretion was between 200 and 300 mg. In the experiment proper the response in 24 hr. excretion of ascorbic acid to a 400-mg. test dose following a 4- to 5-day period on 200-mg. supplements daily was determined for at least 3 periods for each subject, and the individual results served as that subject's standard of

saturation. Similar test doses were given following 6-day periods on graded lower levels of ascorbic acid intake until an intake was found on which the response to the test dose equaled or exceeded the lowest response by the same subject following a period on 200 mg. daily.

The results reported represent a total of 64 experimental periods, or from 7 to 12 periods for each subject, covering a total time for each of from 5 to 17 mo. Two of the subjects required between 70 and 85 mg. of ascorbic acid daily to maintain tissue saturation, three between 85 and 100, and two more than 100 mg. daily. Calculated in terms of weight, the range in requirement for complete saturation was from about 1 to 1.6 mg. per kilogram per day.

Attention is called to the fact that the basal diet was distinctly acid-forming and that the median urinary pH values for the various subjects ranged from 5 to 5.9. Although the effect of the reaction of the diet on the excretion, storage, and requirement of vitamin C is still unsettled, preliminary experiments in the authors' laboratory indicate that there are individual differences in the effect of potential acidity or alkalinity of the diet on urinary excretion of vitamin C. Other incidental observations noted were lower responses to the test dose in one subject during a period of violent exercise, in another during a very hot period, and in still another during a period when atropine was being taken.

The effect of ascorbic acid deficiency on enamel formation in the teeth of guinea pigs, P. E. Boyle (*Amer. Jour. Pathol., 14 (1938), No. 6, pp. 843–848, pls. 6*).—Ground and decalcified cross and longitudinal sections of teeth of normal and scorbutic guinea pigs were studied. The findings indicated that enamel formation is not primarily affected by ascorbic acid deficiency. Rather, the characteristic response is in the inability of the fibroblasts of the periodontium to form the collagen fibers by which the teeth are suspended from the surrounding bone and in the corresponding inability of the osteoblasts and cementoblasts to form normal matrices for the attachment of these fibers. Since these collagenous suspension fibers play an important part in maintaining a protective environment for the formation of enamel, any failure in the formation of the fibers would allow the forces of mastication to act on the formative part of the periodontium. The enamel hypoplasia observed in complete or partial ascorbic acid deficiency is, therefore, a secondary consequence of the deficiency and is adequately accounted for by the failure of collagen fibers and bone maxtrix to form in the periodontal tissues. In normal guina pig teeth the ratio of enamel to dentin is approximately 3:4, but in the scorbutic animals studied the ratios of enamel to dentin varied from 3:1 to 4:1. This resulted from the continuation of enamel formation at approximately the normal rate, while dentin formation was retarded. The author considers that satisfactory evidence of the relation between ascorbic acid deficiency and dental caries has not been established.

Vitamin E deficiency in the suckling rat, M. M. O. Barrie (*Nature [London], 142 (1938), No. 3600, p. 799*).—Supplementing the paper noted previously (E. S. R., 82, p. 284), the author reports that he has confirmed with synthetic *d-l*-tocopherol the curative action of vitamin E concentrates on the characteristic defects in the offspring of vitamin E-deficient rats and considers that this furnishes conclusive proof that the missing factor in the milk of vitamin E-deficient does is vitamin E.

Vitamin E deficiency in the rat.—III, Fertility in the female, M. M. O. Barrie (*Biochem. Jour., 32 (1938), No. 12, pp. 2134–2137*).—This paper continues the series noted previously (E. S. R., 82, p. 284). Post mortem examination of vitamin E-deficient female rats confirmed the earlier findings of other investi-

gators that there is a brown or yellow-brown discoloration of the uterus of such animals. In the present study this discoloration was found to be associated with the deposition of pigment in the muscle layers and degeneration of the muscle. Prolonged vitamin E deficiency caused fibrosis of the uterine muscle, and a certain number of the animals developed fibromyomata of the uterus.

Prothrombin and vitamin K therapy, J. D. STEWART and G. M. ROURKE (*New England Jour. Med., 221 (1939), No. 11, pp. 403–407, figs. 6*).—Experimental data are presented to show that prothrombin levels can be accurately and practically determined by the two-phase titration method involving the preliminary conversion of prothrombin to thrombin in defibrinated plasma with subsequent serial dilution and incubation before the addition of the standardized fibrinogen. The prothrombin concentration was found to fluctuate but little in normal individuals. In obstructive jaundice, however, the level may be dangerously reduced. In such cases a vitamin K-cholic acid mixture taken by mouth was found to be dramatically effective in restoring the prothrombin level to normal. "In such hemorrhagic states as hemophilia, aplastic anemia, and thrombocytopenic purpura, the prothrombin concentration is not reduced and vitamin K therapy is not indicated. The prothrombin level may be reduced in a variety of diseases, such as chronic infection, peptic ulcer, cirrhosis of the liver, chronic ulcerative colitis, malnutrition, and cachexia. Vitamin K therapy may be of value in these conditions, but further study of the question is needed."

TEXTILES AND CLOTHING

Fourth progress report on the cooperative textile project of the northeastern experiment stations, edited by P. B. MACK, A. B. SEARLE, and E. N. CHAPMAN (*Pennsylvania Sta., Jour. Ser. Paper 896 (1939), pp. 37–50, figs. 13*).—This progress report deals chiefly with new equipment which has been secured to test the fabrics submitted for examination in the cooperative project noted previously (E. S. R., 81, p. 154). Equipment for testing the mechanical construction of the fabrics by the same methods as are used in the textile trades includes an improved twist tester, improved dissecting cabinet and thread counter, a universal yarn numbering balance, and a cloth thickness tester. Other new pieces of equipment described include a Flex-O-Meter for determining crease resistance, a hydrostatic machine for determining water repellency, and equipment for accelerated aging tests which are being carried on cooperatively with the textile division of the U. S. Bureau of Standards.

Descriptions are given, with illustrative samples, of several new types of fabrics, including Nylon (E. S. R., 81, p. 155), carbon black pigmented fabrics, photoengraved prints, and all-acetate crepe.

Wool studies.—III, The uniformity of a series of fibre thickness measurements on a small sample of medium Merino wool, A. P. MALAN, H. B. CARTER, and C. M. VAN WYK (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 10 (1938), No. 2, pp. 445–466, figs. 2*).—Continuing this series of investigations (E. S. R., 80, p. 284), a series of fiber determinations was made on a small staple of Merino wool, comparing four different methods of preparing material. These methods are described and their advantages separately discussed. It is concluded that the measurements of a single well-prepared slide will provide an adequate estimate of the mean fiber diameter of a sample of the size examined in the study.

Children's body measurements for sizing garments and patterns, R. O'BRIEN and M. A. GIRSHICK (*U. S. Dept. Agr., Misc. Pub. 365 (1939), pp. V+25, figs. 7*).—This publication describes the derivation of a proposed standard

system of children's body measurements based on a statistical study of nearly 5 million body measurements taken on 133,807 American boys and girls between the ages of 4 and 17 yr. distributed in 15 States and the District of Columbia. The study is part of a cooperative Works Progress Administration research project under the direction of the Bureau of Home Economics, with the cooperation of representatives of 18 colleges, universities, and other educational institutions, including the Universities of California, Minnesota, and Tennessee, the Colorado, Iowa, Kansas, Pennsylvania, and Utah State Colleges, and the Texas Experiment Station. In all, 36 measurements were made on each child. Of these, 18, in addition to age and weight, were selected for intercorrelations, as a result of which height and hip girth measures were recommended as the most satisfactory for the standard system. Age, heretofore used exclusively for pattern size for children, was found to be the poorest prediction of body dimensions.

The statistical data are presented in numerous tables and a list of the measurements used and description of the methods of taking them (from the technical report of E. P. Hunt) are given as an appendix.

MISCELLANEOUS

Fifty-eighth Annual Report of the New York State Agricultural Experiment Station, [1939], P. J. Parrott (*New York State Sta. Rpt. 1939, pp. 50*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Agricultural research serves to relieve the tax burden: Biennial Report [of Oregon Station, 1937–38], R. S. Besse (*Oregon Sta. Bul. 359 (1939), pp. 132, figs. 113*).—The experimental work not previously reported is for the most part noted elsewhere in this issue.

Fifty-second Annual Report of the Pennsylvania Agricultural Experiment Station, [1939], S. W. Fletcher et al. (*Pennsylvania Sta. Bul. 382 (1939), pp. [6]+77, figs. 14*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue. A climatological summary for State College, Pa., for 1938 by C. O. Cromer and C. A. Kern is also included (pp. 74, 75), and a note by P. B. Mack and J. M. Smith (pp. 47, 48) on their findings as to dietary habits and nutritional status of Pennsylvania families.

Fifty-second Annual Report [of Vermont Station, 1939], J. L. Hills (*Vermont Sta. Bul. 452 (1939), pp. 31*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Mississippi Farm Research, [October 1939] (*Miss. Farm. Res. [Mississippi Sta.], 2 (1939), No. 10, pp. 8, figs. 2*).—In addition to articles noted elsewhere in this issue, this number contains Ginners Share in Responsibility for Cotton Quality, by T. N. Jones; A Year in Farm Research, by C. Dorman; Studies of Farmer-Income Reveal Variation Due to Farm Size, Commodity Produced, Price Level; and relative incomes and levels of living of farm, part-time, and industrial families in poor agricultural areas of Mississippi.

Bibliography of tropical agriculture, 1937, 1938 (*Roma: Internatl. Inst. Agr., 1937, pp. VII+420; 1938, pp. VII+466*).—Continuing the series (E. S. R., 79, p. 286), these classified bibliographies deal with the years 1937 and 1938, respectively. Annotations in English and French are given.

NOTES

Arizona Station.—Dr. Edward E. Free, assistant chemist in 1907, physicist in the U. S. D. A. Bureau of Soils from 1908 to 1912, and subsequently in commercial work, mainly as consulting chemist and physicist, died November 24, 1939, at the age of 56 years.

Kentucky University and Station.—Dr. Dewey G. Steele has been appointed assistant professor of genetics and in charge of the section of genetics; W. M. Insko, Jr., in charge of the poultry section; and Lawrence Henson, assistant agronomist in forage crop investigations.

Louisiana Station.—Dr. L. O. Ellisor, assistant entomologist since 1936, died October 21 at the age of 29 years. A native of Texas and graduated from the Texas College in 1932, he received the M. S. and Ph. D. degrees from the Iowa College in 1934 and 1935, respectively. He served as junior entomologist in the U. S. D. A. Bureau of Entomology and Plant Quarantine from 1935 to 1936. On November 20, 1939, he was succeeded by A. L. Dugas.

Maryland Station.—Director Jacob E. Metzger died in Florida on December 25, 1939, at the age of 57 years. A native of Pennsylvania, he was graduated from the Pennsylvania College in 1911 and received the A. M. degree from Johns Hopkins University in 1924. His professional service had been entirely in Maryland, beginning in 1914 as professor of agricultural education. In 1917 he became agronomist and subsequently head of the agronomy department. He was acting dean of agriculture in 1924–26 and made assistant director of the station in 1930. He became acting director in 1937 and director in June 1939.

Massachusetts Station.—H. D. Haskins, for nearly 50 years associated with the chemical work of the station and since 1907 chief of the laboratory for fertilizer control, has retired with the title of emeritus professor of agricultural chemistry.

New Jersey Stations.—George C. Crandall has been appointed assistant poultry husbandman in charge of the recently established Turkey Research Substation (E. S. R., 81, p. 606). Other appointments include Dr. Olin L. Lepard as associate in dairy husbandry in charge of the North Jersey Substation, Dr. Benjamin H. Davis as associate plant pathologist, Kenneth W. Ingwalson as State 4-H Club leader, and Russell E. Underwood as extension specialist in land-use planning.

Oklahoma College and Station.—Dr. Dariel E. Howell has been appointed assistant professor of entomology and associate entomologist vice Dr. L. E. Rozeboom, resigned to become a member of the department of medical entomology in Johns Hopkins University. He will have charge of investigations in insect and tick transmission of bovine anaplasmosis and teach courses in medical entomology and pest control.

Washington College and Station.—Dr. Paul H. Landis, associate rural sociologist, has been appointed rural sociologist and dean of the graduate school. Other appointments include Dr. Ural S. Ashworth as research dairy chemist, Dr. E. P. Painter as assistant chemist, and O. J. Trenary as instructor in agricultural engineering, vice Harvey K. Murer, J. William Cook, and A. C. Jacquot, resigned.

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EXPERIMENT STATION RECORD

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THE INCREASING INTEREST IN AGRICULTURAL HISTORY

During the closing days of 1939 at least two national meetings were scheduled for the presentation of papers pertaining to agricultural history. One of these was held in Washington, D. C., on December 29, 1939, as a joint session of the American Historical Association and the Agricultural History Society. The other took place on the same date in Columbus, Ohio, where the History of Science Society was meeting in conjunction with the American Association for the Advancement of Science.

The simultaneous holding of these meetings was probably more or less a coincidence, but nevertheless it may reflect a deepening interest in what is still a relatively untilled field. Many angles, to be sure, have already received attention, in some instances rather comprehensively. The completion of the trilogy of monographs on agricultural education, research, and extension by Dr. A. C. True some years ago is a conspicuous example, as are also some of the histories of individual land-grant institutions and the invaluable series of miscellaneous studies carried on for more than a decade by the Bureau of Agricultural Economics of the Federal Department of Agriculture. Probably in the aggregate the total number might, if known, appear considerable until compared with what might be done. In that case it might seem less impressive.

Some idea of how broad the field may be is indicated by the diversity of the five papers presented at the two meetings. The first of those at Columbus was entitled Origins of Agricultural Chemistry as a Science, and was given by Dr. C. A. Browne of the U. S. D. A. Bureau of Agricultural Chemistry and Engineering. The second, by Dr. H. G. Good, professor of education in Ohio State University, dealt with the life and work of Amos Eaton (1776–1842), an early itinerant lecturer on natural science, and for many years "professor of chemistry and experimental philosophy and lecturer on geology, land surveying, and the laws regulating town offices and jurors" in the institution which eventually became the Rensselaer Polytechnic Institute. The

Washington papers centered around the theme of Agriculture and Democracy, and included The Farm Journals, Their Editors and Their Public, 1830–1860, by Prof. A. L. Demaree of Dartmouth College; The Land-Grant Colleges—A Democratic Adaptation, by Dr. Earle D. Ross, associate professor of history in the Iowa State College; and Woodrow Wilson's Agricultural Philosophy, by Dr. Carl R. Woodward, secretary of Rutgers University.

Doubtless the steady development of economic and sociological research in agriculture since the passage of the Purnell Act has been a strong stimulus to certain types of historical studies as well. Many of these, however, as carried on by the State experiment stations have been incidental to the main project and intended primarily as a foundation or background. Examination of all active station projects at the present time reveals less than a score so distinctive in theme and treatment as to be classified separately. Most of these deal with the working out of historical trends. Among them are the trends of agricultural cooperation and its history in individual States, economic trends in the dairy industry, statistical trends of farm products over a period of years, and trends in State revenue systems. Other studies deal with interregional competition as revealed by census data since 1850; the assembly and the interpretation of historic basic information on the sugarcane, tobacco, and coffee industries; long-time price series for dairy products; a history of local government; and the factors influencing land values since 1910. All of these projects may be expected to contribute valuable data, but many of them will chiefly point the way to other work of related interest and perhaps of equal or greater value.

Somewhat similar conditions have prevailed in the U. S. Department of Agriculture, but a growing interest may be traced to the development of social science research based in part on the historical method. This interest has been reflected in the Graduate School of the Department. For 1939–40 the principal course listed is one for undergraduates on the social and economic history of American agriculture, but mention should be made of several others of related significance, such as those on the history of botanic research, the history of economic thought, a historical survey of Latin America, the genesis and psychology of rural culture, and the special series of popular lectures on the history of science. In 1939 this series included ten outstanding lectures on Science: Its History, Philosophy, and Relation to Democracy, while for 1940 seven lectures have been scheduled under the caption Conditions of a Durable Peace.

One handicap thus far to the undertaking of comprehensive studies has been the fact that there have been very few historical investigators whose primary interest and viewpoint is that of agriculture. Among

the most productive workers in certain phases of the field have been the pioneers and others of the older generation, from whom have come many invaluable accounts of their respective institutions and the progress of their specialized fields. These contributions, while more or less fortuitous, have often resulted in preserving personal reminiscences and other first-hand information which might easily have been lost or escaped attention. In the future the development of more formal retirement procedures in many institutions may influence this class of researchers both favorably and otherwise, but such possibilities as are attainable for the utilization of competent persons no longer available for full-time employment deserve exploration and encouragement.

Another group by whom considerable meritorious research may be carried on if adequate supervision is at hand is that of graduate students. Some work is going on in this way, but on the whole not very much provision seems to have been made for recognition of agricultural history as even a minor for advanced degrees. Until this can be done there may be some hesitation on the part of promising candidates to embark on what might prove to be in the nature of a detour from the main roads to appreciation and advancement.

Still another obstacle to be overcome is encountered even earlier in the educational picture. This is the lack of opportunity for undergraduate collegiate instruction in agricultural history. A recent examination of the current catalogs of the land-grant institutions revealed specific courses in this subject in but seven institutions, with another of perhaps related scope labeled agricultural philosophy. Four courses were available in one institution, but this was alone in offering more than a single course. Eleven institutions made definite provision for general or economic history in their agricultural curricula, but in 28 the would-be student was apparently placed largely on his own initiative.

Under these conditions relatively small projects, often isolated and fragmentary, seem likely to continue to be the main output to be expected in the immediate future. Fortunately there are abundant opportunities for such studies, and they can be made worth while. Ultimately, however, correlation and synthesis must be sought, the gaps must be filled in, and the larger aspects must receive attention. In view of the unique merits of history as an aid to clear cogitation and correct perspective, in addition to the intrinsic value of the subject, perhaps it is not too early to be thinking in this direction.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Colloid chemistry, H. B. WEISER (*New York: John Wiley & Sons; London: Chapman & Hall, 1939, pp. VIII+428, figs. 103*).—This is a textbook intended for students who have completed a general course in physical chemistry. The book has "a threefold purpose—to acquaint the student with the foundations of colloid chemistry and with the role that the classical experiments have played in the development of the modern theories and applications of the subject, to formulate systematically and to correlate critically the theories underlying colloid chemical behavior, and to illustrate the widely diversified applications of the principles of colloid chemistry in such fields as the industrial arts, agriculture, and biology."

A chapter giving a general introduction to the subject of the colloidal state of matter is followed by 7 chapters on the phenomena of absorption at interfaces of various types, 10 chapters devoted to the formation and properties of lyophobic and lyophilic sols, and shorter sections on gels, emulsions and foams, and aerosols and solid sols. The 3 final chapters deal more fully with applications of colloid chemistry, including a discussion of colloidal clays.

[Chemical investigations at the Puerto Rico Station] (*Puerto Rico Sta. Rpt. 1938, pp. 18–25, 37–45, 129–132, figs. 2*).—This report notes vanilla processing studies (coop. U. S. D. A.), standardization of experimental extraction methods, acceleration of processing by ethylene treatment, lessening of moisture loss by sweating at lower temperatures, uniformity of the dry basis vanillin content in all treatments, experimental testing of five methods of vanilla bean extraction, securing of better vanillin extraction by greater concentration of alcohol, variation of the lead number and resin content of the extracts with the alcohol concentration, effect of the short maceration period of the National Formulary method on analytical results, possible effect of many variables on annlytical results, action of emulsin on vanilla beans, production of a good vanilla aroma in maturing beans by the use of emulsin, relation of aroma quality to maturity of vanilla beans, adaptation of some essential-oil plants to the coffee districts, growth of ilang-ilang trees in Puerto Rico, effect of maceration of ilang-ilang petals in decreasing oil yield and improving aroma, the cananga oil yield of ilang-ilang flowers, determination of fractional distillation periods for ilang-ilang oils, securing of highest oil yields from fully ripe ilang-ilang petals, oil yield of the central parts of ripe ilang-ilang flowers, detrmination of citral yield from lemon grass, and the effect of tin, iron, and copper on the odor and color of ilang-ilang and lemon-grass oils. Work on steam distillation and extraction of ambrette oil is reported. The utilization of cheap oranges for the production of an arange wine is also noted.

Glass helices for packing laboratory fractionating columns, R. W. PRICE and W. C. MCDERMOTT. (Univ. Vt.). (*Indus. and Engin. Chem., Analyt. Ed., 11 (1939), No. 5, pp. 289, 290, figs. 2*).—A simple procedure requiring only equipment available in the laboratory for preparing glass spirals of uniform fiber diameter and spacing is described and illustrated.

Radioactive carbon in the study of photosynthesis, S. RUBEN, W. Z. HASSID, and M. D. KAMEN. (Univ. Calif.). (*Jour. Amer. Chem. Soc., 61 (1939), No. 3, pp. 661–663*).—Using short-lived radioactive carbon, C^{11}, as an indicator, the authors found carbon dioxide containing this radioactive carbon to be fixed in barley plants both in light and in darkness. Some of the results obtained were as follows: Leaves kept in complete darkness, as well as illuminated leaves, formed radioactive carbohydrates. When leaves were placed in the dark for from 2.5 to 3 hr. prior to the administration of $\overset{*}{C}O_2$, however, the formation in the absence of light of radioactive carbohydrates could not be detected. The chlorophyll contained radioactivity after exposure to $\overset{*}{C}O_2$ in the light but not after exposure in the dark. The bulk of the radioactive material found in the plant was water-soluble and was not carbohydrate, carbonate, keto acids, or pigments.

"These results seem to indicate that the cell contains substances, either directly involved in phytosynthesis or in respiration, which react with $\overset{*}{C}O_2$ reversibly in a nonphotochemical process."

[**A. O. A. C. reports presented at the 1938 meeting**] (*Jour. Assoc. Off. Agr. Chem., 22 (1939), No. 2, pp. 210–220, 231–297, 333–338, figs. 3*).—The following reports are contributed from land-grant institutions and the U. S. Department of Agriculture, as indicated: Volatile acids in wine, by M. A. Joslyn (Calif.); soils and liming materials, by W. H. MacIntire (Tenn.); use of peroxides of calcium and magnesium in determination of fluorine content of soils, siliceous materials, and organics, by W. H. MacIntire and J. W. Hammond (Tenn.); H-ion concentration of soils of arid and semiarid regions, by W. T. McGeorge (Ariz.); liming materials, and the ammonium chloride-distillation procedure for the determination of exchangeable bases in soils, both by W. M. Shaw (Tenn.); less common elements in soils, by J. S. McHargue and W. S. Kodgkiss (Ky.); fertilizers, by G. S. Fraps (Tex.); phosphoric acid, by W. H. Ross and J. R. Adams (U. S. D. A.); nitrogen, by A. L. Prince (N. J.); magnesium and manganese in fertilizers, by J. B. Smith and E. J. Deszyck (R. I.); potash, by O. W. Ford (Ind.); acid- and base-forming quality of fertilizers, by L. E. Horat (Ind.); and zinc, by E. B. Holland and W. S. Ritchie (Mass.).

A comparison of the Official and MacIntire-Shaw-Hardin methods for determining available phosphoric acid, J. R. ADAMS. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem., 22 (1939), No. 2, pp. 397–400, fig. 1*).—Agreement between duplicate determinations by means of the MacIntire-Shaw-Hardin method (E. S. R., 79, p. 154) was found as good as that given by the Official method. In half of the samples analyzed very good agreement was found to exist between the results obtained by the two methods, but the MacIntire-Shaw-Hardin method gave high results for 42 percent of the samples. These high values were particularly marked in the case of tricalcium phosphate and calcium hydroxyphosphate. It is noted, however, that "the trend toward the higher availability values tends to fall in line with the published results of vegetative tests."

Effect of fluorine in the determination of citrate-insoluble phosphoric acid by the Official method, L. F. RADER, JR., and W. H. ROSS. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem., 22 (1939), No. 2, pp. 400–408*).—The authors found that neither freshly prepared nor stored fluorine-free phosphate mixtures undergo any significant increase in citrate-insoluble P_2O_5 during the process of analysis when each of the various steps is completed within 1 hr. The presence of calcium fluoride causes little or no increase in citrate-insoluble P_2O_5 during analysis of freshly prepared ammoniated mixtures or mixtures containing di- or tricalcium phosphate over that found when fluorine is absent. A marked rever-

sion of P_2O_5 occurs during analysis of freshly prepared ammoniated mixtures or mixtures containing di- or tricalcium phosphate in the presence of sodium fluoride or other water-soluble fluorine compound. In the presence of calcium fluoride, ammoniated mixtures or mixtures containing di- or tricalcium phosphate undergo a very slow reversion in storage at ordinary temperatures. Increasing the temperature of storage or replacing the calcium fluoride with sodium fluoride increases the rate of reversion. In the presence of a fluorine compound, stored ammoniated mixtures may undergo a small increase in citrate-insoluble P_2O_5 during analysis, but the increase is insignificant if each of the different steps in the procedure is completed within a period of 1 hr.

The quantitative adaptation of the codeine test to the colorimetric determination of selenium in plant materials, J. DAVIDSON. (U. S. D. A.) (*Jour. Assoc. Off. Agr. Chem.*, *22* (*1939*), *No. 2, pp. 450–458*).—In adapting the qualitative codeine test to the quantitative colorimetric determination of selenium in plant materials, it was found that the presence of iron is essential for the development of a stable and relatively lasting color. Consistent results were obtained with this method in recovering selenium added to wheat and in determining selenium in varying weights of a selenium-containing flour. Consistent results were also obtained in determining selenium in different wheats grown in an area in which the soil contains selenium. Results obtained with this method on wheat and on various wild vegetation grown on a seleniferous area compare satisfactorily with results obtained with another method.

Vanadium interferes by developing a color with the codeine solution similar to that formed by selenium itself, but the vanadium color is relatively much weaker; vanadium rarely occurs in appreciable quantities in plants; and correction for the high result produced by vanadium when present can be made by ashing the plant material with monopotassium phosphate at about 700° C. to expel the selenium, determining the vanadium as if it were selenium, and subtracting this result from the uncorrected selenium value.

A rapid volumetric micro method for determining arsenic, C. C. CASSIL and H. J. WICHMANN. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem.*, *22* (*1939*), *No. 2, pp. 436–445, figs. 3*).—A rapid volumetric determination of from 5 to 500 µg. of arsenious oxide can be carried out in less than 10 min. after necessary sample preparation. The results given show an average recovery of 99.5 percent with a standard deviation of 0.85 percent. Results also indicate that the procedure is satisfactory for apple strip solutions. The main features are (1) heating of the evolution solution, (2) a resin tube that prevents the mercury arsenides formed at one stage from adhering to the inside of the delivery tube, (3) the addition of gum arabic to the absorbing solution to keep the arsenides in suspension, (4) adjustment of pH for complete rapid oxidation, and (5) the development of an apparatus and the use of an extraordinarily efficient arsine absorbent, which permits the use of the small volumes necessary for microtitration.

The photometric determination of nicotine on apples, without distillation, L. N. MARKWOOD. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem.*, *22* (*1939*), *No. 2, pp. 427–436, fig. 1*).—A direct photometric method for determining the amount of nicotine spray deposit on apples involves stripping of the fruit with dilute sodium hydroxide solution, purification of the extract by means of a calcium bentonite coagulate, formation of a colored compound from nicotine by means of cyanogen bromide and β-naphthylamine, and measurement of the color with a photometer. Since no distillation is required (except in the presence of lime-sulfur spray material), the method is suitable for rapid mass operation.

Determination of rotenone in derris and cube powders: Use of decolorizing carbon in the chloroform extraction method, J. J. T. GRAHAM. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem.*, *22* (*1939*), *No. 2*, *pp. 408–411*).—Higher percentages of rotenone were obtained from cube powders, and the rotenone-carbon tetrachloride solvate crystallized more readily and had a purer composition, when carbon was used in the extraction flask. The use of carbon with derris powders caused no significant difference in the results.

The determination of thallous sulfate in ant poisons, C. G. DONOVAN. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem.*, *22* (*1939*), *No. 2*, *pp. 411–414*).—The author's method provides for destruction of organic matter by sulfuric and nitric acids, boiling out the nitric acid from the water solution of the residue, neutralizing with ammonium hydroxide, reducing from the thallic to the thallous state by sodium hydrogen sulfite in a slightly acidified solution, and precipitation of thallous iodide by addition of potassium iodide. Re-solution of the precipitate is avoided by washing with 1 percent potassium iodide solution and with absolute alcohol. The thallous iodide is dried to constant weight at 105° C.

Studies on the quantitative estimation of lignin.—IV, Effect of certain proteins on the determination of lignin by the fuming hydrochloric acid method, M. PHILLIPS. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem.*, *22* (*1939*), *No. 2*, *pp. 422–427*).—Continuing earlier work (E. S. R., 79, p. 155), the author shows that the resistance to hydrolysis of the several proteins studied (either alone or in the presence of different proportions of lignified plant material) by cold 42–43 percent and boiling 5 percent hydrochloric acid, as in the method of Goss and Phillips (E. S. R., 76, p. 153), is quite different. Because of this variability it is not possible to compute a fixed ratio between the increase in the weight of the crude lignin and the increment of nitrogen in this material.

Determination of carotene in silage: An improved method, D. M. HEGSTED, J. W. PORTER, and W. H. PETERSON. (Univ. Wis.). (*Indus. and Engin. Chem.*, *Analyt. Ed.*, *11* (*1939*), *No. 5*, *pp. 256–258*).—Increased accuracy in this determination was obtained by substituting a mixture of 100 parts by volume of diacetone with 6 parts of water for 90 percent methyl or 85 percent ethyl alcohol as the solvent for extracting the pigments other than carotene.

Report on vitamin A, J. B. WILKIE. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem.*, *22* (*1939*), *No. 3*, *pp. 465–468*).—Since E values for the U. S. P. reference oil, ranging from 1.4 to 1.79, have been more or less consistently obtained and reported by collaborators, it seemed desirable to employ some single inorganic solution as a basis for checking over-all spectrophotometric performance. No collaborative work was done, but results obtained by the author (as associate referee) indicated that potassium chromate diluted with 0.05 N potassium hydroxide gives satisfactory results over an entire range of concentration. "It is, therefore, recommended that the instruments being used in collaborative work be checked against a suitable potassium chromate solution immediately preceding and after each vitamin A determination. The concentrations and absorption values of the standard test solutions should be reported with the data on the oils being studied."

Parallel chemical determination of vitamin B_1 (aneurin) and cocarboxylase [trans. title], H. ROTH (*Biochem. Ztschr.*, *297* (*1938*), *No. 1–2*, *pp. 52–55*).—A procedure for determining cocarboxylase in water solution by the thiochrome method is described. On the basis of the different solubilities of the blue fluorescent alkaline oxidation product of vitamin B_1 and of cocarboxylase, an analytical procedure was worked out, which sufficed to determine the vitamin and the coferment simultaneously present. Analytically it could be deter-

mined that no phosphoric acid is split off from cocarboxylase by the thiochrome reaction, although the alkaline dehydration product is referred to as diphosphothiochrome. This product, upon heating with normal hydrochloric acid, splits off 1 molecule of phosphoric acid forming thiochrome monophosphate. By combination of the thiochrome method and the fermentation method, the indirect determination of the phosphoric acid ester of cocarboxylase (monophosphoaneurin) is possible.

A new method of the determination of saturation by vitamin C, A. Góth (*Nature* [*London*], *143* (*1939*), *No. 3622, pp. 557, 558*).—It is noted that in single blood tests for vitamin C only extreme values can be interpreted, above 1 mg. per 100 cc. indicating saturation and below 0.4 mg. hypovitaminosis. The method proposed is to determine the vitamin C content of the blood before and 2 hr. after an intravenous injection of 300 mg. of ascorbic acid. If the first determination gives a value less than 1 mg. and the second at least twice as much, saturation is indicated, but if the second determination gives the same value as the first or only slightly higher, a condition of hypovitaminosis is indicated.

The quantitative determination of nicotinic acid and nicotinic acid amide in urine, tissues, and blood [trans. title], K. Ritsert (*Klin. Wchnschr.*, *18* (*1939*), *No. 27, pp. 934–936, figs. 2*).—The method described by Swaminathan (E. S. R., 80, p. 131) for the determination of these compounds in foods is modified for application to urine and other biological materials. The method, as applied to these several substances, is given in some detail. It consists essentially in hydrolyzing the material by heating with hydrochloric acid in order to separate any amide present from the protein with which it is bound and subsequently to convert it to the free acid. After evaporation of the hydrochloric acid the residue is extracted with hot benzene (or a mixture of 3 parts of chloroform and 1 part of isopropyl alcohol) which dissolves the nicotinic acid. After the addition of water the organic solvent is distilled off, and the water solution is shaken with *n*-butyl alcohol or pyridine-free amyl alcohol in order to remove interfering colored substances. The clear water solution is then treated with the reagents cyanogen bromide and aniline, and the resulting yellow compound is taken up in *n*-butyl alcohol or pyridine-free amyl alcohol, the solution being filtered into the cell of a Pulfrich photometer. The reading obtained is matched against the curve established for nicotinic acid from readings on standard solutions of various concentrations.

As determined by this method, 50γ–300γ of nicotinic acid were found per 100 cc. of urine from persons in normal nutrition; 7.85, 3.8, 3.4, 1.2, 0.9, and 6.47 mg. per 100 gm. in rabbit liver, kidney, brain and spinal cord, lung, and muscle, respectively; and 400γ per 100 cc. on an average in sheep and rabbit blood, the values for human blood ranging from 330γ to 460γ per 100 cc.

Report on vitamin D: Present status of the use of the tentative method—feeding of non-vitamin D milk with the reference oil, W. C. Russell. (N. J. Expt. Stas.). (*Jour. Assoc. Off. Agr. Chem.*, *22* (*1939*), *No. 3, pp. 468–470*).—Replies of 18 collaborators concerned with the assay of vitamin D milk are summarized with regard to use and experience with the options of the Official method, depletion period, assay period, and feeding of nonvitamin D skim or whole milk with the reference oil being the points considered. Results of 3 collaborators studying the latter point are tabulated, the findings indicating that a greater line test response was obtained when the milk was fed with the reference oil than when the reference oil alone was fed, and that there was a greater response with nonvitamin D whole milk than with skim milk. It is recommend, therefore, "that further studies be made of the feeding of skim milk or whole, nonvitamin D milk with reference oil, in order to determine

whether the reference oil and a quantity of milk, equal to that of the vitamin D milk being assayed should be used as a reference standard instead of the reference oil alone."

Isolation of vitamin K in highly purified form [trans. title], H. DAM, A. GEIGER, J. GLAVIND, P. and W. KARRER, E. ROTHSCHILD, and H. SALOMON (*Helvetica Chim. Acta, 22 (1939), No. 2, pp. 310–313, fig. 1*).—A homogeneous product, prepared from alfalfa extract and purified by the combined procedure of molecular distillation and chromatographic separation, is described as a bright yellow oil with an absorption spectrum showing four maxima at 248, 261, 270, and 328 mμ. The extinction coefficient, $E^{1\%}_{1\,cm.}$, for the wavelength 248 mμ is 280. A characteristic color reaction occurs when an alcoholic solution of the product is treated with sodium alcoholate. The solution remains bright yellow for a few seconds, then turns deep violet blue; after some time it turns red, and gradually becomes brown. If the brown solution is acidified the color lightens, and an ether extract prepared at this stage gives a residue which no longer shows vitamin K activity and which does not give a spectrum with the characteristic vitamin K maxima but total absorption in the ultraviolet instead.

Elementary analysis shows the product to contain oxygen (7.1 percent), carbon 82.2, and hydrogen 10.7 percent. Boiling point and molecular weight determinations indicate that there are 2 oxygen atoms in the molecule, that is, twice the number indicated by the simplest calculated empirical formula. By catalytic reduction in hexane the vitamin K is reduced to a compound whose absorption spectrum retains the maxima at 248, 261, and 270 mμ, although the band at 328 mμ disappears. Apparently, therefore, the absorption spectrum of the vitamin is associated with two chromatophores, one of which is changed by reduction with hydrogen and platinum in hexane solution. The activity of the purest vitamin K preparation is given as about 20,000,000 units per gram, an activity approximately 100,000 times greater than that of the dried alfalfa.

Determination of volatile fatty acids as an approach to the evaluation of spoilage in canned sardines, F. HILLIG. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem., 22 (1939), No. 2, pp. 414–418, figs. 2*).—The author has extended his previous diagnostic use of volatile acidity determinations to the examination of canned sardines. In packs containing added acetic acid, determination of formic acid in the distillate preserved the essential value of the method as an index of degree of decomposition.

The alcohols as a measure of spoilage in canned fish, D. A. HOLADAY. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem., 22 (1939), No. 2, pp. 418–420*).—Determination of alcohols in the distillate from canned fish was found a useful index of spoilage. The determination was effected by oxidation with excess of 0.02 N potassium permanganate in alkaline solution, addition of potassium iodide to the acidified solution, and titration of the free iodine with 0.02 N thiosulfate. The melting point of the dinitrobenzoic esters of the alcohols present in the fish distillates was from 86° to 89° C., indicating mainly ethyl alcohol with some higher alcohols.

Comparative chemical composition of juices of different varieties of Louisiana sugarcane, C. A. FORT and N. MCKAIG, JR. (*U. S. Dept. Agr., Tech. Bul. 688 (1939), pp. 68, figs. 6*).—Failure of some cane varieties to yield readily clarifiable juices and their inability to yield the quantity or quality of products indicated by the determined sucrose content is attributed to the quantity or character of the nonsugar components. The authors determined apparent and true solids, apparent and true sucrose, acidity, pH value, reducing sugars, ash, Si, Ca, K, Na, Mg, Al, Fe, Mn, S, Cl, P, total and protein N, and gums in the

juices of eight Louisiana canes and made also some study of varieties grown in Florida. High mineral content appeared to be associated with poor quality in sirups and table molasses, and the varieties of high ash content were also apparently the least desirable from the viewpoint of sucrose crystallization. The advantage of a low ash content of some varieties was partly lost because of their high content of noncoagulable nitrogen compounds. Phosphates and protein content, both of which assisted in clarification, showed variation from one variety to another.

Processing and preserving figs (*Texas Sta. Rpt. 1938, p. 143*).—This report notes experiments, by H. M. Reed, indicating 50 min. at 212° F. as the minimum processing time for No. 2½ cans of substandard packs of figs; needless length of blanching or processing as a cause of poor texture; and preserving tests on 27 varieties.

The role of spices in pickled-food spoilage, F. W. FABIAN, C. F. KREHL and N. W. LITTLE. (Mich. Expt. Sta.). (*Food Res., 4 (1939), No. 3, pp. 269-286, fig. 1*).—Whole and ground spices purchased on the open market had a bacterial plate count ranging from 0 to 67,000,000 per gram. Oils of spices, 50 percent emulsions of spices, and spices in a sugar-soluble base were found to be sterile. Ground cinnamon and cloves were the only spices that exhibited any inhibiting action on bacterial growth in low concentrations. Ground peppercorn and allspice showed inhibiting action in 1 percent concentrations; mustard, mace, nutmeg, and ginger in 5 percent concentrations; and celery used in 10 and 20 percent concentrations in nutrient agar against a majority of the bacteria tested.

Some bacteria grew on all concentrations of some of the spices. A great difference in the resistance of different bacteria to the same spice and the same organism to different spices was observed. *Staphylococcus aureus* was more susceptible to the action of spices than many of the other bacteria tested. The oils of spices, 50 percent emulsions of the oils and soluble-sugar bases of the oils, were more inhibitory than the ground spices.

Unsterilized spices, when added to processed dill pickles, spiced peaches, and pears, caused a weakening in the cellular structure which led to slippery and soft pickles and to soft and mushy fruit.

AGRICULTURAL METEOROLOGY

Report of the Chief of the Weather Bureau, 1939, F. W. REICHELDERFER (*U. S. Dept. Agr., Weather Bur. Rpt., 1939, pp. 21*).—This is an administrative report of the work of the Weather Bureau during the fiscal year ended June 30, 1939, including a review of the weather during this period, a summary of progress in marine meteorology, and a record of international meteorological conferences.

Monthly Weather Review, [July–August 1939] (*U. S. Mo. Weather Rev., 67 (1939), Nos. 7, pp. 201-236, pls. 11, figs. 24; 8, pp. 237-319, pls. 17, figs. 64*).—In addition to the usual detailed summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, and bibliographical and other information, these numbers contain the articles noted on pages 443 and 444 and the following contributions:

No. 7.—Annual Rainfall Variability Maps of the United States, by E. E. Lackey (Univ. Nebr.) (p. 201); Thermal Aspects of the High-Level Anticyclone, by T. R. Reed (pp. 201-204); and Further Studies of American Air-Mass Properties, by A. K. Showalter (pp. 204-218).

No. 8.—On the Dissipation of Tall Cumulus Clouds, by J. Namias (pp. 294–296); and Tropical Disturbance of August 1939, by I. R. Tannehill (pp. 296, 297).

[**Abstracts of papers on meteorology**] (*Bul. Ecol. Soc. Amer., 20 (1939), No. 4, pp. 33, 35, 39*).—The following papers are of interest to meteorology: Tree Losses in the Mid-west United States During the Drought of 1933–1939, by F. W. Albertson and J. E. Weaver (Kans. State Col. and Univ. Nebr.); The Effect of Aspect of Slope on Climatic Factors, by J. M. Aikman (Iowa Expt. Sta. and U. S. D. A.); Atmospheric Moisture in Relation to Ecological Problems, by C. W. Thornthwaite (U. S. D. A.); The Ultraviolet Light Environment of Plants and Animals at and Below the Surface of the Sea, by H. H. Darby; and Desert Flora of Northern Peru in an Exceptionally Rainy Year, by H. E. Stork.

Physical meteorology, J. G. Albright (*New York: Prentice-Hall, 1939, pp. XVIII+392, [pl. 1], figs. 246*).—The subject matter of this textbook, emphasizing the physical aspects of meteorology, is taken up under the following chapter headings: The atmosphere, height and pressure of the atmosphere, barometric observations, temperature and its measurement, principles of heat, insolation, water vapor in the air, thermodynamics of the atmosphere, wind directions and velocities, the dynamics of air movements, atmospheric circulation, condensation of atmospheric moisture, precipitation, cyclonic storms, the formation and structure of extratropical cyclones, atmospheric electricity, thunderstorms and lightning, atmospheric acoustics, and atmospheric optics.

The polar front and its place in modern meteorology, C. K. M. Douglas (*Geog. Jour., 94 (1939), No. 2, pp. 135–152, figs. 10*).—This is an address presenting a general review and discussion of the subject.

On the origin of tropical air near the western American mainlands, D. Blake. (U. S. D. A.). (*Bul. Amer. Met. Soc., 20 (1939), No. 9, pp. 385–389, fig. 1*).—A critical review (10 references) of data on the origin of the exceptionally warm, moist air masses often entering the United States via the western Central American and Mexican coasts.

Symposium on weather prediction (*Natl. Inst. Sci. India Proc., 5 (1939), No. 1, pp. 43–165, figs. 41*).—The following papers are included: Seasonal Forecasting in India, by S. R. Savur (pp. 49–60); Medium-Range Weather Forecasts, by S. Basu (pp. 61–73); Air-Mass Analysis and Short Period Weather Forecasting in India, by S. N. Sen and H. R. Puri (pp. 75–91); Forecasting of Nor'westers in Bengal, by S. K. Pramanik (pp. 93–99); Upper Air Data and Weather Forecasts, by K. R. Ramanathan (pp. 101–106); Latent Instability in the Atmosphere and Its Consequences, by N. K. Sur (pp. 107–115); Rainfall Due to Winter Disturbances and the Associated Upper Air Temperatures Over Agra, by S. P. Venkiteshwaran (pp. 117–121); Upper Air Data and Daily Weather Forecasts, by S. K. Pramanik (pp. 123–128); Weather Forecasting for Aviation with Special Reference to Local Forecasts, by P. R. Krishna Rao (pp. 129–138); and Kinematical Methods in Weather Forecasting, by S. K. Banerji (pp. 139–165).

Minimum temperature forecasting in the central California citrus district, C. C. Allen (*U. S. Mo. Weather Rev., 67 (1939), No. 8, pp. 286–293, figs. 16*).—Since it is generally known that within a given area, such as a single citrus grove, minimum temperatures will show local variations of 1° F. or more, it seems entirely reasonable that maximum accuracy is achieved if predictions for definite locations are within 2° of the actual minima. By use of a technic more or less as here outlined, minimum temperature predictions for the Lindsay district key station in San Joaquin Valley are reported to have averaged over 90 percent, and occasionally have been 95 percent, within this 2° limit. It is undoubtedly true that errors of more than 2° sometimes result from causes so confused and individually unimportant that they can be described only as meteorological acci-

dents, and as such they may occur at any time. However, it is probable that such errors can in general be ascribed to lack of precise and timely data on air aloft over the San Joaquin Valley. The water vapor content and temperature of the air to 1,000 or possibly to 2,000 ft. must control to an important degree the net loss of heat at the ground. It is believed that further improvement in minimum temperature forecasting must come from quantitative studies of these lower strata.

A convenient heated precipitation gage, H. LANDSBERG. (Pa. State Col.). (*Bul. Amer. Met. Soc., 20 (1939), No. 9, pp. 383–385, fig. 1*).—The new rain gage described and illustrated is said to overcome some of the shortcomings of present-day precipitation measurements and at the same time to shorten the labor of the observer.

The meteorological history of the New England hurricane of Sept. 21, 1938, C. H. PIERCE (*U. S. Mo. Weather Rev., 67 (1939), No. 8, pp. 237–285, pls. 4, figs. 45*).—This paper presents details of the structure and motion of the storm (E. S. R., 80, p. 730), as shown from the surface and upper-air observations within or near it. In these respects the cyclone is said to have been exceptional owing to its passage into a region where frequent observations from a relatively dense network of reporting stations could be obtained and where a certain amount of aerological material was available. This made possible a more detailed study than had hitherto been attainable with regard to such matters as extratropical fronts, the winds and temperatures aloft in the vicinity of the storm, and the details of a peculiar secondary cyclonic area near the low center. Much of this material is believed to be useful in developing the theory and actual descriptive knowledge of cyclones in general. The series of maps of the storm is reproduced here in full because it is believed that so complete a series is unique in hurricane studies, and because these charts tell much that is left unsaid in the text. This storm has been ranked as "America's costliest disaster." The data presented are discussed under conditions in the eastern United States, fronts in the hurricane, structure of the storm near Washington, hourly course of the storm, maintenance of energy, and explanation of the minor trough.

Recent findings in forest meteorology [trans. title] H. LOSSNITZER (*Deut. Forstw., 21 (1939), No. 26, pp. 337, 338*).—A summary of the present status.

Wind relations in the forest [trans. title], M. WOELFLE (*Forstwiss. Centbl., 61 (1939), No. 3, pp. 65–75, figs. 6*).—This investigation concerned relations of the wind in flowing around hold-over trees, wind velocities over the border zone of a stand lacking in ground cover, the influence of the lower and intermediate parts of a stand on wind velocity over its border zone, and wind relations in and over the crown of an old stand homogeneous as to make-up and age. Practical applications are suggested.

The meteorological requirements of plants [trans. title], A. L. DE FINA (*Rev. Facult. Agron. La Plata, 3. ser., 21 (1936), pp. 187–193*).—A general discussion of the subject, with particular reference to the regional distribution and culture of crop plants in Argentina.

Environment and physiological activities of winter wheat and prairie during extreme drought, W. C. NOLL. (Univ. Nebr.). (*Ecology, 20 (1939), No. 4, pp. 479–506, figs. 14*).—Studies in upland climax prairie and an adjacent winter wheat field were made at Lincoln, Nebr. (September 1933 to September 1934) in the driest and hottest growing season ever recorded. Precipitation was below normal every month except December, and totaled only 10.49 in. for the 11 mo. as compared with a mean precipitation of 24.27 in. Vegetation depended largely on the soil water reserves, and hence no relation was found between precipitation and dry matter production. Prairie produced 67 percent of its dry matter in May, and the wheat field 58 percent. Shallow-rooted plants

died, those of moderate depths suffered greatly, and only the deeply rooted species functioned normally. The dwarfed wheat plants dried early in June before the half-filled kernels could ripen. Wheat afforded a better cover and stabilized temperature changes during winter more effectively than did mowed prairie. Detailed data on precipitation, air and soil temperatures, humidity, wind movements, and water losses by evaporation and transpiration are given and discussed.

Some reactions of the vegetation in the towns and cities of Nebraska to the great drought, R. J. Pool (Univ. Nebr.). (*Bul. Torrey Bot. Club, 66 (1939), No. 7, pp. 457–464*).—The author records the more common and conspicuous reactions and changes in plant life in lawns and parks that occurred during the drought of 1933–38.

Some observations on fifty years of Ohio weather, C. A. Patton (*Ohio Sta. Bul. 608 (1939), pp. [1]+32, fig. 1*).—This bulletin is intended to supplement Bulletin 544 (E. S. R., 72, p. 742), and brings the record to the end of 1937. Most of the average figures remain unchanged, but the average precipitation for winter becomes 8.35 in., spring 10.24, summer 11.62, and autumn 8.49 in. The average date of the last killing frost becomes May 8 and the first in fall October 8.

Rainfall records and studies in Tennessee Valley Authority, R. W. Gay (*Bul. Amer. Met. Soc., 20 (1939), No. 9, pp. 378–383*).—Beginning in 1934 the Tennessee Valley Authority began establishing rainfall stations in such locations as appeared most suitable for supplementing the data already being accumulated, and at present records of 386 stations located in or adjacent to the Tennessee basin are being included. The use of these records in stream-flow forecasting and the effects of increase in number of stations are discussed in some detail. "Generally speaking, outside of the areas of rugged topography, the additional stations change the shape of the isohyetal more than they change annual amounts over large areas."

The climate of Manitoba, A. J. Connor (*[Winnipeg]: Manitoba Econ. Survey Bd., 1939, pp. XII+163, figs. 80]*).—Following a historical and introductory chapter, the author compares Manitoba's climate with others on the North American Continent, and then deals in turn with the temperature variations, precipitation, seasonal extremes and variation, and wind movement in Manitoba, and with the relation of weather there to the general atmospheric circulation.

Early spring frosts in the lower Elbe region and their control [trans. title], K. Bender (*Ztschr. Angew. Met., Wetter, 56 (1939), No. 9, pp. 273–289, figs. 9*).—An agrometeorological discussion with special reference to microclimatic factors, the influence of the wind, radiation measurements, the early spring frost of 1938, frost protection experiments, and local meteorological observations and practical applications of control methods.

The climatic and vegetational regions of Eurasia.—Accompanying text to a map of the climatic regions of Eurasia [trans. title], H. von Wissmann (*Ztschr. Gesell. Erdk. Berlin, 1939, No. 1–2, pp. 1–14, figs. 6*).—A discussion and review with bibliographic footnotes, including the presentation of a revised map of the climatic regions of China.

Climate of the Philippines (*Manila: Philippine Dept. Agr. and Com., 1939, pp. 31, [figs.] 10*).—Since temperature differences in the archipelago are very slight, while rainfall differences are important and decidedly variant due to the combined influence of topography and air-stream direction, the classification of Philippine climate here used is based on types of rainfall, the four types being differentiated by the presence or absence of a dry season and of a maximum of rainfall in winter.

SOILS—FERTILIZERS

[Soil investigations at the Texas Station]. (Partly coop. U. S. D. A.). (*Texas Sta. Rpt. 1938, pp. 15, 16, 134–136, 155–158, 177–179*).—This report contains the following brief progress notes: Higher pH determination on slightly acid soils with the quinhydrone than with the glass electrode, by G. S. Fraps and P. F. Macy; nitrification, by Fraps and A. J. Sterges; soil and water conservation investigations at the Tyler Substation, including permanent cover, crop rotation with a winter cover crop, cultural management of erosion-resistant crops, slope characteristic, soil series, strip cropping, comparison of an unprotected, cultivated field with a wooded slope, terrace grade, terrace spacing, and terraces with strip crops, by J. B. Pope; soil and water conservation investigations at the Temple Substation, including general control plat work, terrace investigations, strip-cropping investigations, protection of eroded lands by revegetation, design and effectiveness of strip cropping, crops for erosion-resistant strips, and soil permeability and soil infiltration studies, by H. O. Hill; and similar work at the Spur Substation, by R. E. Dickson, B. C. Langley, and C. E. Fisher.

The effect of carbon dioxide pressure upon equilibrium of the system hydrogen colloidal clay-H_2O-$CaCO_3$, C. F. Simmons. (Ohio Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 7, pp. 638–648, figs. 7*).—Using a colloidal clay electrodialyzed to remove all acids and bases, the author found that equilibrium in the clay-calcium carbonate-water-carbon dioxide system can be established within from 12 to 15 hr. when calcium hydroxide or calcium oxide is used as a source of calcium. The pH values observed in calcium carbonate-water-carbon dioxide systems agree very well with the calculated values obtained by the use of accepted solubility values. The pH values of clay-calcium carbonate-water-carbon dioxide systems are higher than pH values of corresponding calcium carbonate-water-carbon dioxide systems, making the assumption that soil has no effect on the bicarbonate-ion concentration improbable. The carbon dioxide pressure does affect the absorption of calcium by a hydrogen clay. Increase in carbon dioxide pressure in calcium carbonate-water-carbon dioxide systems increases the relative concentration of H ions much more than it does the calcium-ion concentration. This increase in H-ion concentration, with its much greater specific absorbability, accounts for the decrease in calcium absorption as the carbon dioxide pressure is increased. It is shown that over the lower carbon dioxide pressures this change in calcium absorption is a linear function of the cube root of the carbon dioxide pressure expressed in atmospheres.

The effect of cultivation and erosion on the nitrogen and carbon of some Kansas soils, J. C. Hide and W. H. Metzger. (Kans. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 7, pp. 625–632, figs. 2*).—Organic carbon and total nitrogen determinations showed that, in comparison with the sod sample, cultivation across the slope with cropping has brought about a loss of carbon and nitrogen amounting to 37 and 32 percent, respectively, for the surface 7 in. of soil, and 25 and 20 percent in the 7- to 20-in. layer. The actual loss of carbon was found to become significantly greater as the average annual rainfall decreases from 40 in. in southeast Kansas to 25 in. in north-central Kansas. The carbon loss which occurred from the surface soil where the land has been cultivated across the slope is 16.8 percent less than where cultivation has been up and down the slope. This saving is statistically significant. If only that half of the data from the relatively humid extreme eastern section of the State is considered, the carbon loss was reduced 31.5 percent by cultivation across the slope.

The lateral distribution of potassium in an orchard soil, J. H. GOURLEY and I. W. WANDER. (Ohio Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 7, pp. 590–597, figs. 6*).—Sixty-gm. portions of a potassium salt were mixed with about two-thirds of the soil removed from 18-in. borings and placed in the lower 12 in. of the holes, of which 16 were symmetrically placed in 12- and 9-ft. circles about each of 10 apple trees in a row of 19 trees. Lateral movement of the potassium compound rendered from 1.4 to 2.2 cu. ft. of soil about each hole very high in available potassium. On the assumption of similar effectiveness of all the placements under a single tree, from 22.4 to 35.2 cu. ft. per tree, or from 1.6 to 2.5 percent of the soil to a depth of 2 ft. and within 13 ft. from the trunk of the tree, was increased from very low to very high available potassium content.

"From a practical standpoint, it would mean that potash fertilizers could be dropped behind a deep tillage tool, such as a Killifer disk or coulter, to a depth of 16 to 18 in. This would be within the active absorbing zone of the tree roots in most eastern orchard soils and also below the zone in which potassium is fixed by alternate wetting and drying. Its lateral movement should then be ample for supplying the needs of the tree."

Studies of boron deficiency in Idaho soils, W. E. COLWELL and G. O. BAKER. (Idaho Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 6, pp. 503–512, figs. 5*).—To avoid the time loss and expense incident to field trials, the authors used No. 1 charcoal plate enameled tins as pots in greenhouse tests, all elements essential to plant growth except boron being supplied as a nutrient solution. The enamel of such tins was found not to be destroyed during the growing period. Boron contamination of the nutrient solution was eliminated from consideration in the interpretation of the results by checking this solution in acid-washed quartz sand cultures in similar tins. The nutrient solution contained in each liter 5 cc. M potassium dihydrogen phosphate, 2 cc. M dipotassium hydrogen phosphate, 7 cc. M magnesium sulfate, 7 cc. M calcium nitrate, and 7 cc. M sodium nitrate. Manganese sulfate was added to each pot at the rate of 5 lb. per acre of the element, and in the pots to which boron was added, boric acid equivalent to 5 lb. per acre of the element was used. A good correlation was obtained between greenhouse and field experiments.

Preliminary field tests in northern Idaho indicate that fall applications of borax at the rate of from 40 to 60 lb. per acre are superior to spring applications in overcoming yellowing in alfalfa. The results of a limited number of analyses of alfalfa indicate that a high boron content is associated with freedom from yellowing.

Geographical location and soil organic matter, J. B. HESTER and F. A. SHELTON (*Jour. Amer. Soc. Agron., 31 (1939), No. 7, pp. 598–603, fig. 1*).—The authors present data to show the organic matter content and pH value of certain soils in various sections of the United States and southern Canada and the probable relation of the variations in organic matter content to differences in climate.

The value of legumes for soil improvement, R. COLEMAN (*Mississippi Sta. Bul. 336 (1939), pp. 16*).—In hill sections a good crop of winter legumes turned under was about equal to 24 lb. of commercial fertilizer nitrogen per acre for cotton, and for corn was equal to from 24 to 32 lb. of nitrogen per acre from commercial materials. Summer legumes when interplanted with other crops had little soil improving value, but when not interplanted seemed to have some effectiveness. The cost of the nitrogen as supplied by legumes was found about the same as that of equivalent quantities from commercial nitrogen sources, but the use of legume green-manure crops is considered to have other advantages adding to its value.

The oxidation-reduction potentials of Alabama soils as affected by soil type, soil moisture, cultivation, and vegetation, N. J. Volk. (Ala. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 7, pp. 577–589, figs. 12*).—Cultivated soils generally had a slightly higher Eh (about 10 mv.) in the 0- to 8-in. depth than woodland and grassland soils, but this difference usually was not found in the subsoil. Differences in Eh due to soil types were seldom over 50 mv. The data indicated that these differences are often due to variations in soil material rather than to differences in states of oxidation, swampy soils frequently having higher Eh values than well-aerated upland soils. Increases in moisture in arable soils caused increases in Eh, and vice versa. The seasonal variations in Eh seldom exceeded 60 mv. for any arable soil in Alabama.

It appeared that Eh determinations do not reveal whether or not an arable soil is in an oxidized or reduced state, since the Eh is dependent not only on the ratio of the oxidized to the reduced phases of the ions present but also on the kinds and relative amounts of the ions present.

Qualitative studies of soil micro-organisms, I, II (*Canad. Jour. Res., 16 (1938), No. 4, Sect. C, pp. 152–161, 162–173*).—These two papers open a series dealing with studies on the qualitative nature of microflora of soils.

I. *General introduction*, A. G. Lochhead and C. B. Taylor.—Qualitative studies of the general soil microflora are regarded as essential to a better understanding of microbiological activity in soil and its relation to practical problems of crop growth, soil-borne plant diseases, and general soil fertility. This introductory paper presents a review based upon a biological rather than a biochemical view of soil microbiology.

II. *A survey of the bacterial flora of soils differing in fertility*, C. B. Taylor and A. G. Lochhead.—The authors here report investigations of the qualitative nature and relative incidence of the different types of the bacterial flora of three soils differing in fertility. The organisms were classified into eight groups. Non-spore-forming short rods, of which five groups were recognized, comprised nearly 90 percent of all types. Gram-negative short rods formed the most prevalent single group, rather more numerous than Gram-positive short rods. Gram-variable short rods, coccoid rods, and pleomorphic rods (*Bacterium globiforme*) were regarded as definite groups. Cocci, non-spore-forming long rods, and sporeformers were less prominent soil types.

In spite of unequal productivity, the soils showed no outstanding differences in the relative incidence of the bacterial groups. Certain groups showed some indication of seasonal and cropping effect. The results suggest that the general character of the autochthonous (indigenous) soil flora is relatively uniform in soil of definite type, even though productivity may be greatly altered by manurial treatment. The predominant soil bacteria appear relatively inactive in single culture. Moreover, considerable divergence in biochemical action was shown by apparently closely related forms. It is suggested that the bacterial flora is relatively unstable physiologically, with considerable adaptability, and that the functions of the different species are exercised most fully only under conditions of association.

The acidic properties of peat and muck, I. C. Feustel (*U. S. Dept. Agr., Tech. Bul. 690 (1939), pp. 42, figs. 17*).—A variety of typical samples of peat and muck were fractionated into humic acid, colloid, and residue fractions by treating with a dilute alkaline solution followed by centrifuging and filtration. The course of neutralization of the acidic constituents in the whole samples or as found in the separate fractions was studied by means of potentiometric titrations with barium hydroxide solutions. Titrations conducted with very dilute suspensions of the electrodialyzed materials yielded titration curves

possessing characteristic breaks indicative of practical end points. The humic acid fraction generally accounted for the major portion of the total acidity of the original samples. The neutralization value of the humic acid fractions varied from 3.1 to 5 milliequivalents per gram. Corresponding values for the residue fraction were as low as 0.5 m. e. per gram, whereas those of the colloid fractions were intermediate. Base-exchange capacities and ammonia retained after treatment with ammonia solutions followed by evaporation and drying at 105° C. were also determined. The ratio of the ammonia-retaining capacity to the base-neutralizing value was regarded as particularly significant with respect to qualitative characteristics of the acidic constituents. Low ratios, such as were exhibited by the more fibrous peats and in particular by the residue fractions, were considered as indicative of the presence of a large proportion of weak acids. Sedimentary peat, woody peat, and muck possessed relatively high ratios, indicating a stronger nature of their acids. The continued absorption of base from strongly alkaline solution in excess of that required for "true" neutralization is shown to obey the Freundlich adsorption relationship in principle. Differences in carbon and nitrogen contents found among different materials and different fractions are discussed.

Evaporation of moisture from soil in large lysimeter pots, P. L. Gow (*Hawaii. Planters' Rec.* [*Hawaii. Sugar Planters' Sta.*], *43* (*1939*), *No. 4, pp. 287–290*).—Water-consumption data for 16 2 by 2 by 2 ft. concrete lysimeter pots, treated with asphaltum to prevent leakage, are recorded for the months of July, August, and September, 1938, with parts of June and October of the same year. These figures indicate losses by evaporation from the uncropped soil of a magnitude which appeared to be "contrary to certain established ideas with respect to soil-water relationships."

Availability of soil moisture, particularly as affected by depth, in the soil of the Kentucky Experiment Station farm at Lexington, P. E. Karraker and C. E. Bortner. (Ky. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31* (*1939*), *No. 7, pp. 653–660*).—Below 4 or 5 ft., cropped and uncropped Maury silt loam soil contained approximately its maximum field capacity. Above this, moisture decreased toward the surface but below 2 to 3 ft. no faster in the cropped than the uncropped areas. Above 2 to 3 ft. the decrease was considerably greater in the cropped than in the uncropped areas. This indicates that the crops obtained water chiefly from the top 2 to 3 ft. Observations of depth of root penetration showed that the crops did not root effectively below this depth. In pot experiments, 12 percent of water in the surface soil and from 23 to 24 percent in the subsoil was unavailable to corn plants, so that even if crops rooted extensively in under soil layers the amount of water obtained here would not be great.

Seasonal water and nitrate leachings in relation to soil and source of fertilizer nitrogen.—A second report on Windsor lysimeter series "A," M. F. Morgan and O. E. Street (*Connecticut* [*New Haven*] *Sta. Bul. 429* (*1939*), *pp. 43, figs. 17*).—This bulletin presents a detailed study of the volume of drainage water and rate and quantity of nitrogen loss in two relatively sandy soils, the Merrimac loamy sand and Merrimac sandy loam types, and two relatively loamy soils, the Enfield very fine sandy loam and Wethersfield loam types, during a 5-yr. period. Previous work has been noted (E. S. R., 75, p. 751).

The progressive removal of nitrates from the soil by leaching was shown to be a logarithmic function of the amount of water passing through the soil, a given increment of drainage water causing the leaching of a definite proportion of the amount of nitrate nitrogen left in the soil by previous increments. Of

the nitrate nitrogen residue, 50 percent was leached by 0.95 acre-in. of drainage water from the sandy soils, and by 1.4 acre-in. from the loamy soils.

When the fertilizer material supplying nitrogen to the soil is not initially in the form of nitrates, as in case of nitrate of soda, the ammonia nitrogen either in the fertilizer as such or developed by hydrolysis or biological decomposition must be subjected to nitrification processes in the soil before it is materially affected by leaching. Urea is more rapidly leached from the soil than either sulfate of ammonia or cottonseed meal. The latter two materials are similar with respect to their rapidity of nitrification, but a given quantity of nitrogen in the form of cottonseed meal develops a much smaller amount of nitrate nitrogen in the course of the year. Less than two-thirds of the nitrogen from cottonseed meal has become available in the soil in the form of nitrates in these trials.

In seasons when the rainfall is abundant but not excessive, the use of 200 lb. of nitrogen per acre, supplying 40 lb. immediately available as nitrates and the remainder as organic nitrogen, provides nitrates in desirable quantity during the period of most rapid demand by the tobacco crop, with little left in the soil at harvest time. Nitrate nitrogen applied before planting time may often be leached from the soil during early summer rains, but, unless the leaching is severe during July the organic nitrogen is able to build up the soil to a favorable level by the time the crop needs it most. This may not be quite sufficient; hence some nitrate nitrogen is a desirable supplement to the natural organic nitrogenous materials. If a more quickly and completely available source of nitrogen, such as urea, is used as a partial substitute for organic meals, fertilizer nitrates are less likely to be needed and may be definitely objectionable in dry seasons. The total amount of nitrogen supplied in the fertilizer before planting should also be somewhat diminished, with side dressings of nitrate nitrogen if weather conditions are favorable for leaching.

It was further shown that a summer rain of less than an inch rarely produces leaching unless the soil is practically saturated by rains occurring during the past 2 days. After a week or more without rain, a 2-in. precipitation causes little or no leaching on loam soils but may seriously deplete the available nitrogen from sandy soils. Severe storms with a rainfall of 4 in. or more within a 3-day period remove from 50 to 75 percent of the nitrate nitrogen from loamy soils and from 75 to 90 percent from the sandier soils. However, if the leaching takes place during the first 2 or 3 weeks after the fertilizer is applied, a comparatively small proportion of the nitrogen from such nonnitrate materials as urea, cottonseed meal, or sulfate of ammonia will be lost, even though the rainfall is quite heavy. Severe leaching occurring 6 weeks or more after the fertilizer is applied may practically exhaust the available nitrogen potentiality of the fertilizer, irrespective of the form in which the nitrogen is supplied, as during the July rainfall in 1938.

"Large accumulations of nitrate nitrogen in the soil, in excess of the immediate needs of the crop, may be practically avoided in case of slow growing, long season crops and are rarely found under grass cover. However, it is probably not possible to provide tobacco and similar plants with all the nitrogen they need during the period of their most rapid growth without building up a considerable previous surplus of nitrates. If this is depleted by leaching, it must be replaced as quickly as possible, else the crop must suffer."

Factors influencing the availability of native soil phosphate and phosphate fertilizers in Arizona soils, W. T. McGeorge (*Arizona Sta. Tech. Bul. 82 (1939), pp. 293–331, figs. 4*).—Rapid chemical field tests for available phosphate were found not applicable to alkaline calcareous Arizona soils because both

the reaction of the soil and the ratio of the quantity of soil to the quantity of solvent affected the solubility of the soil phosphates. A laboratory method in which "carbonic acid" (carbon dioxide gas passed through a water suspension of the soil) was used as the solvent was satisfactory, however; and the Neubauer method (E. S. R., 53, p. 319) proved useful.

It was found that absorption of phosphorus by plants on Arizona soils is slightly increased by magnesium sulfate, but this effect is not considered significant as an aid to phosphate nutrition. Absorption of natural soil phosphate was not significantly influenced by nitrogen fertilizers, but in using phosphate fertilizers a nitrogen deficiency limited phosphate response. Phosphate was found to be absorbed more readily by plants from calcium-saturated than from sodium-saturated soils. Carbon dioxide, because of its effect upon the pH value of the soil, increases the availability and absorption of phosphate by plants. Calcium hydroxide and calcium carbonate, because of their effect upon the pH of the soil and as sources of calcium ions, reduced the availability and absorption of phosphate. All the water-soluble phosphates, ortho, meta, and pyro, were excellent sources of phosphate as plant food for phosphate-deficient alkaline calcareous soils. The value of calcined phosphate was shown to be directly related to its fineness, the 200 mesh being almost equal to monocalcium phosphate in the Neubauer test. Raw rock phosphate, fused phosphate rock, and colloidal phosphate were found of practically no value as a source of plant food phosphate on alkaline calcareous soils. Sodium metaphosphate proved extremely effective as a phosphate fertilizer. Soluble phosphate fertilizers were fixed in a surprisingly available form, as shown by the residual response obtained in pots and in the field. Metaphosphates were subject to greater fixation by calcareous soils than the orthophosphate.

A lysimeter study of losses of applied potash by leaching from an acid soil, P. L. Gow (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 43 (1939), No. 4, pp. 263–276, fig. 1*).—Neither potassium chloride nor potassium carbonate was leached "to any serious extent" from pots carrying a cane crop. Applying potassium salts with ammonium sulfate did not render the leaching losses greater than those occurring when the potassium compounds were applied after nitrification of the ammonium salt. In uncropped pots potassium carbonate was leached less than the chloride, but in pots cropped to cane there was little difference. It appeared that potassium salts in excess of crop needs would probably be lost to a considerable extent.

Activated sludge—Milorganite, C. J. Rehling and E. Truog. (Univ. Wis.). (*Indus. and Engin. Chem., Analyt. Ed., 11 (1939), No. 5, pp. 281–283*).—Protein 37.5 percent, cellulose 7, fat 6.5, free iron oxide 6.1, sand 2.4, silt 13.4, clay 14.4, and water 6.2 percent were found, together with phosphates, sulfates, and compounds containing calcium, magnesium, potassium, aluminum, titanium, sodium, and measurable quantities of manganese, copper, zinc, cobalt, boron, iodine, and "many other elements." The trace requirement elements were mostly in an easily soluble condition. The main fertilizer value, however, is attributed to approximately 6 percent of nitrogen and 2.5 percent of available phosphoric acid. A base-exchange capacity of 22.4 milliequivalents may be of some value in sandy soils. Tests made on the material directly did not show the presence of plant hormones. However, after mixture and incubation of the material with a sandy soil, hormones of the indole-substituted fatty acid type were produced as in similarly treated fish meal, cottonseed meal, and other organic material.

Commercial fertilizers report for 1939, E. M. Bailey (*Connecticut [New Haven] Sta. Bul. 430 (1939), pp. 63*).—The contents of this bulletin are restricted

to an abstract of the State fertilizer registration law and the analytical data resulting from the 1939 fertilizer inspection.

Commercial fertilizers, 1939, E. R. TOBEY (*Maine Sta. Off. Insp. 173 (1939), pp. 47–98*).—In addition to the elements usually determined, this report of fertilizer analytical data for 1939 gives water-soluble and total magnesium calculated as the oxide on all samples guaranteed to contain this element; in five samples, boron as borax; and manganese as the element in two brands.

AGRICULTURAL BOTANY

Botany of the living plant, F. O. BOWER ET AL. (*London: Macmillan & Co., 1939, 3. ed., pp. XII+700, [pl. 1], figs. 504*).—A revision of the textbook previously noted (E. S. R., 50, p. 727).

[Abstracts of botanical papers] (*Bul. Ecol. Soc. Amer., 20 (1939), No. 4, pp. 27, 33, 38, 39, 40, 41*).—The following are of interest to botany: Plant Ecology of Three Northwestern Colorado Lakes and Surrounding Areas, by K. R. Johnson; Successional Trends in the "Balds" of Roan Mountain, by D. M. Brown; Root Studies in Secondary Succession Stages on Eroded Soils, by R. M. Warner (Iowa Expt. Sta. et al.); A Preliminary Report on Pollen Studies of Buried Soils of the South Carolina Piedmont, by S. A. Cain (Univ. Tenn. and U. S. D. A.); Primary and Secondary Succession Studies in the Bass Lake Area, Northern St. Louis County, Minnesota, by J. B. Moyle and E. L. Nielsen (Univ. Ark. et al.); Primary and Secondary Succession Studies in the Sunken Lake Area, Itasca County, Minnesota, by E. L. Nielsen and J. B. Moyle (Univ. Ark. et al.); A Botanical Survey of Bois Blanc Island, Mackinac County, Michigan, by M. T. Bingham; Salt Marsh Plants in Relation to Tide Levels on the Californian Coast, by I. L. Wiggins; Development of the Nut Grass Plant (*Cyperus rotundus* L.), by J. R. Jackson and E. V. Smith (Ala. Sta.); A Comparative Study of the Subterranean Members of Several Crop Plants, by H. J. Dittmer; Methods in Aerobiology, by O. C. Durham; Changes in Grassland Vegetation in Western North Dakota 1932 Through 1939, by W. Whitman, H. C. Hanson, and R. Peterson (N. Dak. Sta.); Species Senescence, by S. A. Cain (Univ. Tenn.); Plant Ecology—The Two Uses of the Term, by F. E. Egler; *Vegetation of a High Mountain Valley in Southern Colorado*, by F. Ramaley; and Unrecognized Initial Stage of Plant Succession and Its Prominence in Soil Erosion Control in the South-Central United States, by W. E. Booth.

[Botanical Society of Washington, 292nd meeting] (*Jour. Wash. Acad. Sci., 29 (1939), No. 12, p. 552*).—Abstracts of the following papers of interest to botany are included: Mycological and Pathological Observations on *Crotalaria*, by H. W. Johnson; and New Facts in Photosynthesis, by E. D. McAllister.

[Botanical studies in Texas], H. B. PARKS and A. H. ALEX (*Texas Sta. Rpt. 1938, pp. 103, 104, 105*).—Tests of *Amoreuxia wrightii*, *Berberis swazeyi*, and the genus *Polypteris*, and canaigre (*Rumex hymenosepalus*) are briefly noted.

Convenient seedling support for growing plants in water culture, S. DUNN. (N. H. Expt. Sta.). (*Plant Physiol., 14 (1939), No. 4, pp. 836, 837, fig. 1*).—Paraffined mosquito netting is fastened over the mouth of a jar by a rubber band, the pocket thus formed being filled with washed sand of particle size large enough not to pass through and seeds being planted in the sand.

Metering pump and turntable arrangement for supplying measured quantities of nutrient solution successively to any number of culture vessels, H. G. DU BUY. (Univ. Md.). (*Plant Physiol., 14 (1939), No. 4, pp. 832–835, figs. 5*).—The advantages claimed for the apparatus described and illustrated are that the water or culture solution contacts only glass, the amount of

liquid to each jar is well defined and can be varied at will, the wide tubing used throughout prevents all clogging, all glass parts may be easily removed for cleaning and are easily adjustable, and the method is not time-consuming, since only the constant-level reservoir has to be filled after long intervals.

The use of prontosil as a vital dye for insects and plants, W. Carter (Univ. Hawaii). (*Science, 90 (1939), No. 2339, p. 394*).—A note on tests in which Neoprontosil proved a useful vital stain for both plant and insect, corn seedlings taking up the dye with extreme rapidity, and different corn leafhopper (*Peregrinus maidis*) individuals fed on the dye either through the treated plant or through a membrane showing all degrees of coloration from none to a dense red diffused color.

Symbols and abbreviations in taxonomic botanical literature, C. H. Muller. (U. S. D. A.). (*Taxonom. Index, 2 (1939), No. 5, Extra Sup., pp. 6*).

Pollen analysis as a paleo-ecological research method, S. A. Cain. (Univ. Tenn.). (*Bot. Rev., 5 (1939), No. 12, pp. 627–654*).—This monographic review (over three pages of references) includes a brief historical sketch of the development and purposes of such studies, assumptions forming the basis of the method, technic for field and laboratory work, the present status of pollen analysis, and a glossary of special terminology.

Plant material introduced by the Division of Plant Exploration and Introduction, Bureau of Plant Industry, January 1 to March 31, 1935 (*U. S. Dept. Agr., Inventory 122 (1939), pp. 92*).—This number lists 2,450 lots of plant material, with descriptive notes in many cases.

An illustrated manual of California shrubs, H. E. McMinn (*San Francisco: J. W. Stacey, 1939, pp. XI+689, [pl. 1], figs. 775*).—The author has aimed to present a systematic and descriptive account of the shrubs of California which will serve as a working manual for their identification. While primarily designed for the general public, the book was written to serve also the professional botanist interested in the native shrubs of the State. All those vegetative forms classified as woody perennials and semiwoody plants except trees and the succulent-stemmed shrubs of the cactus family are included, about 800 species and 200 varieties of native plants recognized in these groups, and 14 naturalized introduced species being referred to. Keys to the genera and families, a glossary of botanical terms, an index to species names, nomenclatorial changes, a bibliography, and a chapter on the use of California shrubs in the garden design (by F. H. Schumacher) are included.

Plants used by the Eskimo of the northern Bering Sea and Arctic regions of Alaska, J. P. Anderson (*Amer. Jour. Bot., 26 (1939), No. 9, pp. 714–716*).—Discussion of a survey, with a list of 40 seed-bearing plants used by the Eskimos, mostly for food.

A floristic study of a developing plant community on Minnesota Point, Minnesota, O. Lakela (*Ecology, 20 (1939), No. 4, pp. 544–552, figs. 6*).—Studying this sand bar, about 7 miles long and south of Duluth, the author discusses the pioneer vegetation and that of the second to fourth years, the plant migration, and the floristic changes, including a complete list of the 96 species and varieties as they invaded the area during the 4 yr. of successional development.

A new forest climax: The salt spray climax of Smith Island, N. C., B. W. Wells. (Univ. N. C.). (*Bul. Torrey Bot. Club, 66 (1939), No. 9, pp. 629–634, figs. 2*).—Recently reported observations (E. S. R., 80, p. 168) indicate that live oak (*Quercus virginiana*) is the only broad-leaved dicotyledonous tree whose mature leaves will withstand the destroying action of moderate salt spray. Smith Island, an area 3 miles wide at the Cape Fear angle of the

eastern United States coast line, is covered with a nearly pure stand of very old climax live oaks, under which dogwoods indicate the high degree of soil maturity. It is concluded that in the history of the island, salt spray was the selective factor in bringing about the dominance and persistence of the salt-resistant live oak, and it is further suggested that the spray factor largely accounts for the distinctive coastal distribution of live oak as a dominant throughout its range. This discovery of a climax factor dependent on a direct factor which in turn depends on a climatic factor (wind) indicates that for the general coastal region the polyclimax concept must be held.

Notes on the distribution and ecology of Ananas and Pseudananas in South America, K. F. Baker and J. L. Collins. (Hawaii. Pineapple Prod. Expt. Sta.). (*Amer. Jour. Bot., 26 (1939), No. 9, pp. 697–702, figs. 2*).—Evidence is presented that *Pseudananas* and most *Ananas* species are native to the area of South America between lat. 14° and 29° S. and east of long. 59° W. From exploration and examination of herbarium material their distribution and ecological relations were studied, and the results are here presented.

Geographical distribution of some American Polyporaceae, L. O. Overholts. (Pa. Expt. Sta.). (*Mycologia, 31 (1939), No. 6, pp. 629–652, figs. 30*).—The author attempts to predict the eventual range of certain species of pileate Polyporaceae in the United States and Canada, the procedure being to compare maps showing the present known range of each fungus species with maps showing the distribution of the major hosts or substrata. From these data predictions are made, both as to the filling of gaps in present distributional knowledge and as to the possible extensions of ranges in the future. The relation of certain climatic factors to distribution as briefly discussed, and some of the pitfalls in such a procedure are pointed out. Attention is called to the fact that our herbaria could be greatly enriched from this viewpoint if more local collectors would submit specimens. Collections of species from States and provinces in which these gaps occur are requested.

The fungi of Manitoba and Saskatchewan, G. R. Bisby et al (*Ottawa: Natl. Res. Council Canada, 1938, pp. 189, pls. [14]*).—This monograph amplifies the work published in 1929[1] to include records of the numerous collections of fungi made in Saskatchewan, as well as a considerably increased number of entries for Manitoba, revised determinations where necessary or possible, and expanded notes on the species of fungi found. In addition to the section dealing with the individual species listed by taxonomic groupings, various more general and special subjects are included, such as the natural features and fungi of certain areas of Manitoba, the fungi of Saskatchewan (by R. C. Russell), geographical distribution, immigration and ecology, new species of fungi, fungi apparently absent, rare species, estimates of the total number of fungus species and the history of mycology in Manitoba, etc. Indexes to hosts and to genera and orders of fungi, and a bibliography of 254 titles complete the work.

Notes on Typha angustifolia L. in Iowa, A. Hayden. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci., 13 (1939), No. 4, pp. 341–351, pls. 4*).—An ecological study, including reference to micro-organisms causing a rotting of the rootstocks and a first report of *T. angustifolia* and its variety *elongata* as being abundant locally in northern Iowa. Associated with the narrow-leaved types were forms intermediate between *T. angustifolia* or its variety and *T. latifolia*. The inland environment is compared with the coastal marshes.

[1] The fungi of Manitoba, G. R. Bisby, A. H. R. Buller, and J. Dearness. London and New York: Longmans, Green & Co., 1929, pp. X+194, [pl. 1].

Suckleya suckleyana: A poisonous plant, E. N. STOUT (*Colo. State Col. Expt. Bul. 359–A* (*1939*), *pp. 7, figs. 2*).—Brief description of the plant with illustrations, symptoms, and treatment of poisoning by it, and eradication measures.

The seleniferous Astragalus osterhoutii Jones, O. A. BEATH. (Univ. Wyo.). (*Amer. Jour. Bot., 26* (*1939*), *No. 9, pp. 729, 730*).—*A. osterhoutii* and *A. lonchocarpus* are considered valid species of the Lonchocarpi group. The former is confined in its growth to seleniferous soils and is also capable of absorbing toxic amounts, so that it is looked upon as a livestock hazard and a soil contaminator. *A. lonchocarpus* is not confined to seleniferous soils and is regarded by stockmen as a safe forage. The genetic relations of these differences are discussed.

Morphogenetic differences between Nicotiana alata and N. langsdorffii as indicated by their response to indoleacetic acid, L. NAGEL (*Ann. Missouri Bot. Gard., 26* (*1939*), *No. 4, pp. 349–372, pls. 2, figs. 5*).—In studying the rôle of growth substances in morphogenesis in these two species, the corollas were found to serve as especially favorable material since they followed the same general growth pattern but differed markedly in cell elongation. The results indicated that *N. alata* has the greater ability to use additional growth substance, while it is also more sensitive and smaller amounts prove toxic to young cells. Corollas of *N. langsdorffii* gave evidence of inactivation of growth substance except in the limb. Young flower stalks inserted in growth substance solution responded by curvature on the side opposite the leaf insertion, the response being much greater in *N. alata*, and in both species depending on the age of the stem and the concentration of growth substance. Many of the principal differences between the two species were found to lie in a genetically controlled difference in ability to use growth substance.

Floral development of certain species as influenced by X-radiation of buds, E. L. JOHNSON (*Plant Physiol., 14* (*1939*), *No. 4, pp. 783–795, pl. 1, fig. 1*).—Blossoms developing on plants of *Salpiglossis sinuata*, *Phlox drummondi*, and tobacco which had been irradiated during the reproductive stage with one medium dose of X-rays showed ±10 types of floral abnormalities, common to all three species being white stippling, spotting, and streaking of corolla lobes, color changes, increased and decreased number of corolla lobes, and dwarf blossoms. Buds of phlox and tobacco were markedly susceptible, for a dose of 2,000 r-units caused frequent abscission of buds, while *Salpiglossis* was insensitive to similar treatment. A definite relationship was found between bud size at time of irradiation and occurrence and character of flower anomaly. In *Salpiglossis*, buds over 1 cm. long at time of irradiation usually developed normally. Types of anomalies generally appearing during the early part of the blooming period included stippling, spotting, and streaking of the corolla, as well as changes in color, while those occurring more commonly during the middle and latter part of the blooming period were split corolla tubes, dissected margin of lobes, puckered corolla tissue, changes in number of lobes, and dwarf blossoms. Toward the end of the blooming period, normal blossoms began to appear in increasing numbers.

The structure and development of the apical meristem in the shoots of Taxodium distichum, G. L. CROSS (*Bul. Torrey Bot. Club, 66* (*1939*), *No. 7, pp. 431–452, pls. 2, figs. 25*).—This histocytological study of the common baldcypress takes up the general features of the twigs, initiation of the "pseudoendogenous" buds, growth at the apex of the shoots, the surface layer of the apical meristem, the subapical portion of the shoot apex, and the origin of the leaves. The data obtained fail to support the theory that the shoot apex in many primitive vascular plants is homologous with the corpus in angiosperms.

The sieve-tube system of our trees and its seasonal changes [trans. title], B. Huber (*Jahrb. Wiss. Bot., 88 (1939), No. 2, pp. 176–242, figs. 38*).—Both evergreen and deciduous species were included in this monographic histocytological study, comprising such trees as oak, birch, walnut, locust, poplar, elm, ash, spruce, and arborvitae.

The effect of prolonged chilling on water movement and radial growth in trees, W. R. C. Handley (*Ann. Bot. [London], n. ser., 3 (1939), No. 12, pp. 803–813*).—The woody shoots of young potted saplings of *Fraxinus excelsior* and *Acer pseudoplatanus* were subjected to continuous cooling at ±2° C. during the growth season, with the result that radial growth was almost completely stopped throughout the woody stem. This chilling did not adversely affect longitudinal growth except that it was later in commencing and slower. When the temperature around the stem was lowered from 2° to 0° water conduction was cut to such an extent that the leafy shoots wilted, turgidity again being recovered with return to 2°. This wilting effect is discussed with particular reference to the part played by living cells in the upward movement of the water in the wood.

The ventilation of tree trunks, D. T. MacDougal (*J. West. Shade Tree Conf., Palo Alto, Calif., 1936, Proc. Ann. Mtg., pp. 50–52*).—The air in a tree trunk is found to be a closed system, with communication with the external air permitting exchange at a specific rate which has been seen to differ widely in the five trees examined (arroyo willow, redwood, Monterey pine, Arizona desert oak, and California live oak). Some trees show a great capacity for mending breaks in this reservoir, while others do not. While the application of paints and oil-soluble material to cut surfaces on stumps or in cavities is done primarily as a defense against infection, such treatment also seals up breaks in the pneumatic system. It is important that the material should not emit penetrating or injurious gases or liquids as do many antiseptics. Representing the readiness of flow of air into and out of tree trunks by averages for comparison, the willow would be denoted by 5, redwood by 15, the pine by 24, desert oak by 36, and California live oak by 53, these figures indicating the relative facilities for ventilation of the trunks.

The formation of growth rings in Indian trees, I, K. A. Chowdhury (*Indian Forest Rec., n. ser., Util., 2 (1939), No. 1, pp. [3]+39, pls. 10*).—The results of a detailed study of growth ring formation in the seven species named are presented in detail. None of them were found to have any resting period during the active growing season, and all showed cessation of growth between late October and late November. Analyses of external factors such as temperature, rainfall, and humidity brought out no direct correlation with the beginning and cessation of growth. The interdependence of these factors is discussed fully, and the difficulty of isolating the effect of any one factor is stressed. The internal factors (heredity, growth-promoting substances, etc.) are also discussed, and the present impossibility of assigning growth activity to any particular factor is pointed out.

The molecular chain structure of cellulose and its botanical significance, R. D. Preston (*Biol. Rev. Cambridge Phil. Soc., 14 (1939), No. 3, pp. 281–313, figs. 9*).—This comprehensive, critical review (163 references) discusses the work which has led to present views on the structure of cellulose, the chief structural polysaccharide of the plant cell wall. To this end the results of organic chemistry, X-ray analysis, and of polarization optics are mentioned, and data from other sources are summarized when necessary. In spite of the prevalence of the idea that the cellulose chains in the primary wall lie transversely, it is deemed quite clear that in the cases critically examined they form a spiral re-

embling that in the secondary wall, and apparently the development of a spiral n the secondary wall is not unconnected with its existence in the primary wall. The nature both of the cell wall and of the cytoplasm is probably involved in wall deposition. Thus a new layer deposited on a wall may be so influenced by xisting layers that the cellulose chains composing it lie parallel to those of the ld wall, but the fundamental orienting mechanism must lie in the cytoplasm, or each wall originates as a new layer at cytokinesis. The evidence pointing to protoplasmic streaming as a mechanism involved is believed to be unconvincing, nd it seems not unreasonable to suggest that the configuration of the protein molecules at the cytoplasm-wall interface may be involved.

Effects of certain insecticides and inert materials upon the transpiration rate of bean plants, E. C. Wagner. (Ohio State Univ.). (*Plant Physiol., 4 (1939), No. 4, pp. 717–735, figs. 7*).—"Zinc-safened, basic, and ordinary commercial calcium arsenates, chemically pure Bancroft clay and silica, and a solution f dicalcium arsenate all brought about significant increases in the transpiration ate of bean plants, as determined by both a study of cut shoots in potometers nd the loss in weight of potted plants. The application of zinc-safened and asic calcium arsenates brought about as great an increase in the rate of water oss of the treated plants as did the ordinary commercial material. In this case he phytocidal action of a compound is not correlated with its capacity to increase the transpiration rate of the injured plants. If injury becomes apparent, owever, as burned areas on the leaves, these plants will show a higher rate of water loss than the uninjured plants. For greenhouse plants, the increased rate f water loss was most apparent at night when the treated plants were compared with controls. This was not the case for the plants kept in the indoor culture room. Chemically inert Bancroft clay and silica, as well as physically inert dicalcium arsenate in solution, brought about equally large increases in the transpiration rate of the treated plants as compared with controls. An attempt is made to explain some of the results on the basis of changes in stomatal action brought about by the application of the different materials studied."

Oxygen requirements for germination of seeds of Nyssa aquatica—tupelo gum, I. V. Shunk. (Univ. N. C.). (*Science, 90 (1939), No. 2346, pp. 565, 566*).—Since, as shown by the tests reported, lack of aeration apparently prevents sprouting of the "seed" (endocarp plus seed) of *N. aquatica*, it, like *Taxodium distichum*, cannot come in on an area kept constantly flooded.

Respiration of acorns as related to temperature and after-ripening, J. W. Brown (*Plant Physiol., 14 (1939), No. 4, pp. 621–645, figs. 10*).—Measurements were made of respiration, catalase activity, and germination of white oak (*Quercus alba*) and northern red oak (*Q. borealis maxima=Q. rubra*) acorns which had been stored at 0° and 2.5° C. to obtain an indication as to the physiological differences between the two species during the overwintering period. Measurements were also made of respiration and germination of the red oak acorns which had been stored at 0°, 2.5°, 10°, 12.5°, 15°, 17.5°, and 20° during the overwintering period to determine the physiological changes and the progress of afterripening at these different temperatures. The red oak acorns showing the highest germination had a respiratory quotient of 0.3 in storage, and storage at 10° and 12.5° proved best for germination. Measurements of catalase activity did not materially aid in interpreting the progress of afterripening or the potential germinability. Although the gas exchange rates may differ slightly, the physiological activity of both species of acorns is very similar, as indicated by comparable respiratory quotients when stored at 0° and 2.5°. Detailed data are presented.

Respiration and fermentation in the carrot, Daucus carota.—I, Respiration, P. B. Marsh and D. R. Goddard (*Amer. Jour. Bot., 26 (1939), No. 9, pp. 724–728, figs. 3*).—Respiration of the root was reversibly inhibited by low concentrations of cyanide and azide, but the former at 10^{-2}M did not do so completely. Respiration of the root was also inhibited by CO, but could be reversed by light. The enzyme combining with CO had an affinity for O_2 of 9–13 times that for CO. These results suggest the operation of an enzyme similar to or identical with the cytochrome oxidase of yeast. The light-reversed CO inhibition of respiration indicates that catechol oxidase is not the enzyme involved in carrot root respiration. Carrot roots killed by boiling, though not consuming O_2, still gave a positive Nadi reaction and also catalyzed the oxidation of a mixture of *p*-phenylenediamine and catechol. Respiration in immature carrot leaves was similar to that of the roots in being inhibited by NaN_3, HCN, and CO, but the mature leaves were not so influenced.

The influence of the degree of saturation of soil colloids on the nutrient intake by roots, H. Jenny and A. D. Ayers. (Univ. Calif.). (*Soil Sci., 48 (1939), No. 6, pp. 443–459, figs. 8*).—A quantitative theory is developed which relates base exchange to the degree of saturation. The exchangeability of adsorbed K decreases with decreasing degree of saturation, and the nature of the complementary ions markedly affects these relationships. The physiological availability of adsorbed K was investigated by use of excised barley roots, and corresponding studies were made with true solutions containing K ions. In this way it became possible to separate K intake into colloidal chemical-exchange and biological-accumulation phases. Lowering the degree of K saturation resulted in a reduced intake of this element. In accordance with the exchange theory the rate of decline was greatly affected by the nature of the complementary cation. In these tests Ca proved least effective, NH_4 had the greatest influence, and H and Na occupied intermediate positions. Certain practical applications of the findings are discussed.

Foliar diagnosis: Physiological balance between the bases lime, magnesia, and potash, W. Thomas and W. B. Mack. (Pa. Expt. Sta.). (*Plant Physiol., 14 (1939), No. 4, pp. 699–715, figs. 4*).—Continuing these studies (E. S. R., 80, p. 27), the results here presented are believed to indicate that the law governing the absorption of the principal bases—lime, magnesia, and potash—is, under optimum conditions, a linear function like that governing the relationship between nitrogen and phosphoric acid in plants. The experiments were at first conducted with corn and later with potato, and the significance of the equations obtained relating to the absorption of the three variables, CaO, MgO, and K_2O is discussed and their bearing on the work of earlier investigators is described. It is concluded that the evolutionary sequence of the composite Ca–Mg–K unit constitutes a sensitive and faithful diagnosis of the mode of adaptation of the medium (soil) to the needs of the plant with respect to CaO, MgO, and K_2O when the respective graphs presented are interpreted in relation to the optimum treatment. The bearing of the results on studies of human and animal nutrition is indicated.

The minor elements in agriculture, K. C. Beeson. (U. S. D. A.). (*Tab. Biol., 18 (1939), No. 1, pp. 61–65*).—As an initial step in the approach to the problems associated with minor elements in relation to soils, fertilizers, plant growth and composition, food quality, and animal and human health and nutrition, the U. S. Department of Agriculture has compiled and analyzed the available information relating to the minor elements in food plants. A part of the data obtained from both published and unpublished sources is here summarized, with 104 literature references.

Evidence for the essentiality of silicon for growth of the beet plant, G. J. RALEIGH. (Cornell Univ.), (*Plant Physiol.*, *14* (*1939*), *No. 4*, *pp. 823–828*, *fig. 1*).—The results of experiments here reported indicate silicon to be an indispensable element for growth of the beet plant (*Beta vulgaris*).

Contributions to enzyme research, VIII, edited by F. F. NORD and R. WEIDENHAGEN (*Ergebnisse der Enzymforschung. Leipzig: Akad. Verlagsgesell.*, *1939*, *vol. 8*, *pp. X+324*, *figs.* [*71*]).—This monograph includes the following articles, some in English: Purified Viruses and Virus Proteins, by R. W. G. Wyckoff (pp. 1–12); Mechanism of Symbiotic Nitrogen Fixation, by P. W. Wilson (pp. 13–54); The Biological Significance of Optimum pH for the Digestive Enzymes of Vertebrates [trans. title], by H. J. Vonk (pp. 55–90); The Significance of Enzymes in Clinical Diagnosis [trans. title], by R. Ammon and E. Chytrek (pp. 91–134); Enzymatic Analysis of the Antigenic Structure of Pneumococci, by R. J. Dubos (pp. 135–148); Enzymatic Changes Induced by Fusaria—a contribution to the Mechanism of Alcoholic Fermentation [trans. title], by F. F. Nord (pp. 149–184); Low Molecular Carriers of Biological Oxido-Reductions and Their Potentials [trans. title], by F. G. Fischer (pp. 185–216); Aldehyde Mutase, by M. Dixon (pp. 217–246); Animal Tissue Respiration [trans. title], by C. Martius (pp. 247–266); Enzymes of Wood-Rotting Fungi, by S. R. Bose (pp. 267–276); and The Genetics and Biochemistry of Flower Colour Variation, by R. Scott-Moncrieff (pp. 277–306).

Properties of crystalline enzymes and their precursors (with the exception of the respiratory ferments), by J. H. NORTHROP (*Tab. Biol.*, *18* (*1939*), *No. 1*, *pp. 76–94*, *figs. 17*).—Tabulations with descriptions and literature references are given.

Plant growth and growth hormones, C. A. SHULL (*Ill. State Acad. Sci. Trans.*, *32* (*1939*), *No. 1*, *pp. 15–18*).—In concluding this address the author says: "If we know under what conditions certain trace metabolites are formed, and what responses the plant makes in growth and development when these trace metabolites are present in sufficient concentration, we are only a step away from the complete control of the organism's development. We are moving steadily forward toward this goal."

Early root and shoot growth in two varieties of Avena sativa in relation to growth substances, S. KAISER and H. G. ALBAUM (*Amer. Jour. Bot.*, *26* (*1939*), *No. 9*, *pp. 749–754*, *figs. 5*).—A simple method for growth measurements on oat seedlings over a period of 4–5 days is described, and differences in early root and shoot growth in darkness are presented for Black Norway and Fulghum oats, late and early flowering varieties, respectively. When treated with aqueous solutions of indole-3-acetic acid at 0.01–5.0 mg./l., their roots showed the same maximum inhibition, and the time of occurrence was essentially the same in both varieties at low concentrations but later for Fulghum at the higher concentrations. There was a direct relation between the time of maximum inhibition and the logarithm of concentration used. The straight line plots had markedly different slopes in the two varieties. Concentrations up to 50 mg./l. increased the root number similarly in both, while low concentrations were relatively ineffective. The two varieties differed in the effect on early shoot growth of applications in solution (0.002 and 2 mg./l.) through the roots, Black Norway shoots showing more rapid growth while Fulghum shoots were unaffected. Black Norway coleoptiles were also more sensitive. These results are interpreted in part on the assumption that Fulghum normally produces auxin more rapidly than Black Norway.

Alcohol extraction of growth hormone from plant tissue, G. S. AVERY, JR. (*Amer. Jour. Bot.*, *26* (*1939*), *No. 9*, *pp. 679–682*, *fig. 1*).—An absolute ethanol

method for rapidly extracting all alcohol-soluble growth substance from ground plant tissues is described. Neither ether nor chloroform is used, and extracts can be prepared quickly for standard tests. Thus far exhaustive tests have been made only with endosperms and entire seeds of maize.

The relation of "coenzyme R" to biotin, P. M. WEST and P. W. WILSON (Univ. Wis.). (*Science, 89 (1939), No. 2322, pp. 607, 608*).—Data briefly presented permit of three conclusions: (1) Coenzyme R and biotin are identical, (2) they are distinct but with such similar chemical and physical properties that the authors have thus far been unable to separate them, or (3) they are distinct but each acts as a growth stimulant for either or both yeast and rhizobia. Final decision as to the relationship must rest until both factors are available in pure form.

Response of tomato plants to β-naphthoxyacetic acid, S. C. BAUSOR (*Amer. Jour. Bot., 26 (1939), No. 9, pp. 733–736, figs. 3*).—This acid induced growth responses in intact tomato plants at 1.0–0.01 percent, while a 0.001-percent solution in lanolin had no effect. The reactions observed and described for different concentrations are explained on the assumption of dilution of the substance as it diffused from the lanolin and from cell to cell in the plant. The development of root primordia followed application of 1.0- and 0.1-percent pastes, both of which also inhibited growth in treated tissues. The reaction rate was very rapid.

Experiments on bud inhibition with indole-3-acetic acid, F. SKOOG (*Amer. Jour. Bot., 26 (1939), No. 9, pp. 702–707, fig. 1*).—Excised pea buds cultured in White's solution continued to grow in darkness up to several weeks, thus offering opportunity to determine auxin effects thereon. With 0.0006–10.0 mg./l. indole-3-acetic acid in the nutrient solution, all but the lowest concentrations markedly inhibited bud growth during the first few days after applying, and this effect was reversible and not due to toxicity. The weak and also the stronger solutions perhaps caused a subsequent growth stimulation when the buds were transferred from the latter to plain nutrient solutions after short periods, but if the buds were kept in solutions higher than 0.1 mg./l. they remained shorter than the controls throughout the experiments. Further tests and other evidence presented indicate that auxin applied to stems also reaches the lateral buds to inhibit their growth. It is concluded that even though the inhibition may not be explainable in terms of concentrations alone, indoleacetic acid can inhibit growth directly in buds, and that whether or not the effectiveness of auxin in correlative inhibition is influenced by an effect on translocation of nutrients or by other factors, auxins applied directly to decapitated stems probably generally exert an inhibitory action in the lateral buds.

Phytohormones of the auxin-group, V. J. KONINGSBERGER, M. H. VAN RAALTE, A. M. A. VAN SANTEN, and J. B. THOMAS (*Tab. Biol., 18 (1939), No. 1, pp. 95–112, figs. 13*).—Test methods and their variability and the isolation of auxin and its chemistry are included.

Analysis and integration of various auxin effects, I, II, F. W. WENT (*K. Nederland. Akad. Wetensch. Proc., 42 (1939), Nos. 7, pp. 581–591; 8, pp. 731–739, fig. 1*).—Part 1 of this critical analytical review deals with the existence of calines, different approaches to the analysis of the action of auxin, effects of auxin in the pea test, evidence for a dual effect of auxin in *Avena* coleoptile growth, explanation of bud inhibition on the basis of the dual effect of auxin on growth, the dual effect of auxin on root formation, effect of auxin on carbohydrate translocation, and a summary of the different reactions in which auxin takes part. In part 2 the author discusses the molar activity of different substances in the growth reaction, and presents general considerations on growth and differentiation. It is concluded that in any of four auxin-induced phenomena

(growth in length, pea test, bud inhibition, and root formation) the effect of auxin is dual—a preparatory reaction, pH insensitive, preceding the actual growth or root-forming reaction proper. The different reactions are summarized, and analyzing growth into its component parts the author synthesizes them into a graphic illustrative scheme, which is presented.

Auxins and the inhibition of plant growth, K. V. THIMANN (*Biol. Rev. Cambridge Phil. Soc., 14 (1939), No. 3, pp. 314–337*).—This is a critical review (130 references) of the inhibiting effect of auxins on shoots, the inhibition of roots and of buds, and the mechanism of inhibition.

Photo-inactivation of auxin in the coleoptile of Avena and its bearing on phototropism.—Preliminary note, W. F. F. OPPENOORTH (*K. Nederland. Akad. Wetensch. Proc., 42 (1939), No. 9, pp. 902–915, fig. 1*).—A method is described and fully discussed for determining the auxin content of the lighted and shaded sides of illuminated coleoptiles (oats used) separately by means of ether extraction. The results proved rather unstable, and thus only statistical values can be used. Immediately after an illumination of 500 M. C. S., ±30 percent of the auxin in the coleoptile tip had disappeared, as well from the lighted as from the shaded side. It is assumed that the lactone fraction of the active compounds (auxin-*a*+auxin-*a*-lactone) is inactivated by radiation, carotinoids acting as sensitizers. This inactivation, being equal at both sides, cannot explain the phototropic curvature. Evidence is given that phototropism is due chiefly to a redistribution of auxin, the extreme coleoptile tip being responsible. Synthesis of auxin is believed to be changed by or after illumination. The photo-growth reactions caused by illumination on all sides are explained by the inactivation of auxin. The same holds true for the weak phototropic basal response of the coleoptile. It is therefore concluded that photogrowth reactions and phototropism are not directly related.

Phototropism, J. VAN OVERBEEK (*Bot. Rev., 5 (1939), No. 12, pp. 655–681*).—This critical review (119 references) discusses the subject under these headings: The study of phototropism led to the discovery of auxin, phototropism is due to differential elongation, the mechanism of elongation, phototropism on a photochemical basis, the Blaauw theory of phototropism, the Cholodny-Went theory, light growth response explained in terms of auxin, explanation of phototropic curvatures, diaphototropism, dwarfism at high altitudes, photosensitizers, phototropism of roots, and light growth response and phototropism of *Phycomyces* sporangiophores.

Photoperiodic aspects of phasic development, W. F. LOEHWING (*Science, 90 (1939), No. 2346, pp. 552–555*).—This is a critical review of the present status of the subject, with a discussion of problems as yet unsolved and suggested lines of attack. It is concluded that the thermo- and photo-phases are not as rigidly set apart or as irreversible as formerly supposed. "Further, it may prove desirable and conducive to a better understanding of reproduction if the photophase is subdivided into a flowering and gametogenic stage. If the profound and rapid transformations occurring between inception of flower primordia and fertilization, namely, the phenomena of sex, are studied as intensively as vernalization and photoperiodism, they promise to contribute fully as much as the former to our understanding of reproduction. If speed and magnitude of transformation be criteria of vital significance, the gametogenic or sexual phase per se represents the stage of most profound alterations in the ontogeny of the higher plants."

Photosynthesis in the ear of barley, and the movement of nitrogen into the ear, D. J. WATSON and A. G. NORMAN (*Jour. Agr. Sci. [England], 29 (1939), No. 3, pp. 321–346, fig. 1*).—In tests (1936–37) on pot-cultured barley to determine

the effects of shading the ear or shoot after ear emergence, it was found that after ear emergence both ear and shoot made about equal contributions to the total assimilation. In the first test 28 percent and in the second 19 percent (minimum estimates) of the final dry weight of the ear was accounted for by assimilation in the ear itself. The effects of shading on the N content of the plant at harvest varied somewhat, but they were always small compared to the effects on dry weight. Shading tended to reduce the amount of N in the ear, but as the dry weight of the ear was reduced much more, N as percentage of dry matter in the ear was increased. It is thus concluded that translocation of N compounds to the ear does not depend closely on the amount of concurrent increase in dry weight of the ear. The approximate constancy of N apparent in the ear and grain throughout development results from the particular conditions during normal growth in the field. The tests indicated that 20–30 percent of the dry weight of the plant was added after ear emergence, suggesting that climatic conditions during this late growth stage are of considerable importance in determining final yields.

Distribution of nitrogenous fractions, sugars, and other substances in Ananas grown in darkness versus daylight, C. P. Sideris, B. H. Krauss, and H. Y. Young. (Hawaii. Pineapple Prod. Expt. Sta.). (*Plant Physiol., 14 (1939), No. 4, pp. 647–676, figs. 14*).—Two pairs of pineapple shoots from two mother plants were used, the two members of each pair being of about the same weight and degree of development at the end of 1 mo. in the greenhouse. One of the members from each pair was then kept in darkness for 4 mo., the others remaining in the greenhouse. Fruits on the former ripened 1 mo. earlier. At harvest the leaves, stems, and fruits were sectioned to separate senile from mature, mature from young, and chlorophyllous from nonchlorophyllous tissues. The results are detailed as to total weight of plants, chemical properties of fruits, amounts of total soluble solids in shell v. flesh of fruits, and distribution of different fractions of inorganic, soluble organic, and protein nitrogen, and sugars in the leaves, stems, and fruits of the two series. Notable was the rather conclusive indication that the accumulation of sucrose in storage organs under the minus light conditions was practically nil. Furthermore, the ratio values of soluble organic to protein nitrogen were considerably greater for the leaf, stem, and fruit tissues of the plants grown in darkness than for those in the light, indicating that in the darkened series assimilation of inorganic nitrogen had proceeded only to the stage of soluble organic but not to that of protein nitrogen.

Somatoplastic sterility in Medicago sativa, R. A. Brink and D. C. Cooper. (Wis. Expt. Sta. et al.). (*Science, 90 (1939), No. 2345, pp. 545, 546*).—The collapse of ovules following abnormal growth of the somatic tissue adjacent to the embryo sac observed in alfalfa is shown to be causally related to local hyperplasia of the maternal structures, hence the term "somatoplastic sterility" for this type of seed failure believed to occur in many plants. Only about one-fifth as many fertile ovules collapsed after cross-breeding as after selfing. The initial conditions in the ovule outside the embryo being alike in the two cases, it is believed clear that the higher survival after crossing results from the more active growth of the hybrid endosperm. Following self-fertilization, the growth rate of the endosperm is frequently so low that the balance soon shifts in favor of the integument. Hyperplasia then arises, causing collapse of the endosperm and eventually ending the development of the ovule.

Proceedings of the local branches of the Society of American Bacteriologists (*Jour. Bact., 38 (1939), No. 4, pp. 480, 481*).—The following are of interest to agricultural botany: Testing the Efficiency of *Rhizobium meliloti*, by J. T. Kroulik (Kans. State Col.); and The Utilization of Certain Carbohydrates

and Sugar Derivatives by Rhizobia and Closely Related Bacteria, by C. E. Georgi and J. M. Ettinger (*Univ. Nebr.*).

Routine tests for the descriptive chart—morphological and biochemical, B. COHEN, M. W. JENNISON, J. A. KENNEDY, ET AL. (*Pure Cult. Study Bact.*, 7 (1939), No. 4, Leaflet 5, 7. ed., pp. 20, fig. 1).—The methods described in this leaflet are intended primarily for aerobic saprophytic bacteria, and cannot therefore be considered applicable in general to obligate parasites or strict anaerobes. A copy of the descriptive chart is included.

Growth factors for bacteria.—IX, Studies of a growth factor for Clostridia, D. W. WOOLLEY, L. E. MCDANIEL, and W. H. PETERSON. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 131 (1939), No. 1, pp. 381–385).—In continuation of this series (E. S. R., 82, p. 162) and using procedures described for concentrating an essential growth factor for *Clostridium butylicum*, the most active preparations were detectable when 0.001 µg. per cubic centimeter was added to an otherwise synthetic medium, while addition of 0.1–0.5 µg. per cubic centimeter induced the maximum response. The active substance was an acid of low volatility, difficult to esterify, but a methyl ester was prepared which was biologically active. The activity of the factor was destroyed by oxidation, but was not affected by acetylation or methylation. Fermentation in the purified medium produced a normal yield of solvents (acetone, isopropyl alcohol, ethanol, and butanol). Several but not all species of *Clostridium* tested responded to additions of this growth factor.

Bacterial dissimilation of carbohydrates, C. H. WERKMAN. (Iowa Expt. Sta.). (*Bact. Rev.*, 3 (1939), No. 2, pp. 187–227).—In this comprehensive review (over six pages of references) the author attempts to reconstruct, in the light of present knowledge, the biochemical events occurring in the living bacterial cell concerned with the dissimilation of carbohydrates, the discussion following such lines as biological oxidation, the mechanism of anaerobic dissimilation (fermentations), and principal and secondary respiration.

Thiamin effects in bacterial metabolism, M. SILVERMAN and C. H. WERKMAN (*Iowa State Col. Jour. Sci.*, 13 (1939), No. 4, pp. 365–368).—This is a review, particularly of work done in the authors' laboratory during the preceding year, involving the physiological effects of thiamin or vitamin B_1 on the living cell.

Root nodule bacteria, P. W. WILSON and W. B. SARLES. (Univ. Wis.). (*Tab. Biol.*, 17 (1939), No. 4, pp. 338–367, figs. 5).—The authors present, including 27 tabulations, descriptions of the bacteria (bacteriological characteristics and chemical composition); bacterial-plant (cross-inoculation) groups of Rhizobia and Leguminosae; characteristics of the nodules (cytology, composition, and transfer of nitrogen fixed to the host plant); the agent of fixation (bacteria alone, plant alone, and association of plant and bacteria); and characteristics of the fixation process (carbohydrate-nitrogen relation, excretion of nitrogen, effect of bacteriophage, and strain variation-host plant specificity). The bibliography contains over three pages of references.

Investigations upon the antigenic relationships among the root-nodule bacteria of the soybean, cowpea, and lupine cross-inoculation groups, O. A. BUSHNELL and W. B. SARLES. (Wis. Expt. Sta.). (*Jour. Bact.*, 38 (1939), No. 4, pp. 401–410).—A large number of serological types were found among the root-nodule bacteria from plants of the soybean, cowpea, and lupine groups. Strains within a serological type possessed antigenic constituents in common, these occurring in whole, heated, and washed-heated cells. There was apparently no correlation between the ability of strains of *Rhizobium* from the three plant groups to cross-inoculate and to cross-agglutinate. One serological type may be made up of strains isolated from one plant species, in other cases of strains isolated from two or even three species. Antisera for the different anti-

genic modifications of soybean, cowpea, and lupine bacteria failed to agglutinate whole-cell antigens of alfalfa, clover, or pea bacteria.

Excretion of nitrogenous substances from root nodules: Observations on various leguminous plants, G. Bond and J. Boyes (*Ann. Bot.* [*London*], *n. ser.*, *3* (*1939*), *No. 12, pp. 901–914*).—The authors described experiments designed to detect any excretion of nitrogenous substances from the root nodules of different varieties of soybean, pea, and broad bean, various bacterial strains being used for inoculation and soil and three grades of sand serving as rooting media. Consistently negative results were obtained from the sand-culture tests, thus confirming the theory that excretion is not a constant feature of healthy growth in legumes. The results of the soil cultures were inconclusive. The experimental conditions and findings are compared with those of other investigators.

Symbiotic promiscuity of two species of Crotalaria, J. K. Wilson. (Cornell Univ.). (*Jour. Amer. Soc. Agron.*, *31* (*1939*), *No. 11, pp. 934–939*).—The data here given substantiate and extend those previously noted (E. S. R., 81, p. 622). In these studies 182 isolations were used, being obtained from plants representative of each plant-bacterial group and from many species not yet placed in any group or possibly from which isolations had never before been made. The same type of promiscuity was observed with these isolations as that previously reported. It appears that the particular isolation employed in making the tests will determine whether a species is placed in this or that group, which is taken to mean that the plant-bacterial groups as now recognized are entirely inadequate and should be abandoned. In this connection, *C. grantiana* bore nodules with organisms from 11 of the plant-bacterial groups and with organisms from 14 legume species not included in any group. It is therefore logical, with present methods of naming these organisms, that any strain of the Rhizobia may be given different names at different times by different workers, depending on the source from which it was obtained. Such findings may explain some of the apparent contradictions in the literature.

GENETICS

Cytological studies of Arctic grasses, K. Flovik (*Hereditas*, *24* (*1938*), *No. 3, pp. 265–376, pl. 1, figs. 104*).—Material collected at Isfjorden, Spitsbergen, showed the following (2*n*) chromosome numbers plus fragments (f) in several species: *Alopecurus alpinus* 130+1f, 112+3f, 114+2f; *Arctagrostis latifolia* 62; *Arctophila fulva* 42; *Calamagrostis neglecta* 28; *Deschampsia alpina* 41, 49, 39; *Dupontia fisheri* 88+1f, 88+3f; *D. fisheri psilosantha* 44+2f, 44+3f; *Festuca rubra arenaria* 42, 42+1f; *F. ovina brevifolia* 28; *F. ovina vivipara* 49; *Hierochloe alpina* 56; *Phippsia algida* 28; *P. concinna* 28; *P. concinna algidiformis* 29; *Poa abbreviata* 76; *P. alpigena* 84, 77; *P. alpigena colpodea* 51+5f; *P. alpigena vivipara* 42+4f; *P. glauca* 70–72; *P. alpina vivipara* 44, 42+4f; *P. arctica* 56; *P. arctica vivipara* 56; *Puccinellia angustata* 42; *P. phryganodes* 28; *P. vahliana* 14; and *Trisetum spicatum* 28. The morphology and behavior of chromosomes are described and illustrated for each species, and general discussion is accorded chromosome morphology, the original basic chromosome number in grasses, and the occurrence of polyploidy and vivipary in the Arctic grasses. The literature cited embraces 179 references.

Cytology of the genus Lespedeza, W. P. Pierce. (Univ. Wis.). (*Amer. Jour. Bot.*, *26* (*1939*), *No. 9, pp. 736–744, figs. 27*).—The chromosome numbers were determined for 22 species and 3 varieties of the genus, and in 4 out of 5 species whose numbers had been previously reported showed a disagreement.

It is suggested that the basic number for the American species is 10, while for the rest of the genus, on the basis of work to date, it is considered likely that it is 11.

Chromosome complements of five species of *Poa* with an analysis of variation in *Poa pratensis*, W. L. BROWN (*Amer. Jour. Bot., 26 (1939), No. 9, pp. 717-723, figs. 15*).—Previously unreported chromosome numbers were determined for four species of *Poa*. A high degree of nonrandom intraspecific variation was found in *P. pratensis*, due to polyploidy and aneuploidy. For 12 biotypes $2n$=41-64 chromosomes are reported, and the probable occurrence of apomixis and the presence of "group segregation" form a basis for the suggestion of an alloploid origin for this species. A hypothesis, based on the genome balance within the germ plasm, is offered to explain the morphological variation within the species.

Chromosome numbers of Californian Salvias, W. S. STEWART (*Amer. Jour. Bot., 26 (1939), No. 9, pp. 730-732, fig. 1*).—Paralleling the morphological diversity of the group, diverse haploid chromosome numbers of 8, 11, 12, 13, and 16 were found. There was evidence neither for nor against the suggestion that the species could have arisen either as the result of hybridization alone or as allopolyploids.

Sex chromosomes of *Cannabis sativa*, E. L. MACKAY. (Purdue Univ.). (*Amer. Jour. Bot., 26 (1939), No. 9, pp. 707, 708, figs. 6*).—An unequal (XY) pair of sex chromosomes was found and believed to be present in staminate plants of all varieties of common hemp (*C. sativa*).

Note on some colchicine-induced polyploids, A. MÜNTZING and E. RUNQUIST (*Hereditas, 25 (1939), No. 4, pp. 491-495*).

[Inheritance studies with sheep and goats by the Texas Station], B. L. WARWICK, J. M. JONES, S. P. DAVIS, W. H. DAMERON, H. C. MCPHEE, and D. A. SPENCER. (*Texas Sta. Rpt. 1938, pp. 34-36*).—Progress is reported on studies of the inheritance of the ridgling characteristic in goats, type in Angora goats, skin folds on Rambouillet sheep (coop. U. S. D. A.), and fiber characteristics in Rambouillet and Romney sheep and their crosses.

Coat colors in horses, F. GREMMEL. (Univ. Ariz. and Tex. Expt. Sta.). (*Jour. Hered., 30 (1939), No. 10, pp. 437-445, figs. 2*).—Chemical and histological study of the pigment in the hairs of horses showed that there was but one pigment present. This pigment was amber in color and was deposited in the form of granules, more or less fused into clusters of irregular shapes and sizes, which determine the color and shade of the hair. The tips of the hairs were more intensely colored than the bodies of the hairs. There were nine basic colors and three basic patterns.

Evidence available indicated that coat colors are determined by three major loci and modifying genes. The triple recessive gives the pseudoalbino coat color, which is modified to a very light cream, and often causes the eyes to be light blue. The triple dominant is black. The dominant B factor seems to give a sorrel, and the third factor a bay. Combinations and the effects of dominant qualitative genes on patterns are discussed.

Inherited macrocytic anemias in the house mouse, H. GRÜNEBERG (*Genetics, 24 (1939), No. 6, pp. 777-810, figs. 4*).—The hematology of two types of anemic mice (W^1W^1 and W^2W^2) and their normal sibs was studied. The data showed that the W^1W^1 young were considerably lighter at birth than normals and did not gain in weight but finally died. The homozygous W^2 young gained weight but were always slower than their normal litter mates. There did not seem to be a significant difference between the heterozygotes W^1w and W^2w and the homozygous normals ww. Hematologically there was a reduction in the

erythrocytes to about half in the young W^2 anemics, but the white corpuscles showed less reduction. The erythrocyte diameter and volume of hemoglobin was increased in the anemics. The relative frequency of reticulocytes tended to be higher in the anemics than in the normals, and the absolute number of reticulocytes turned out by the blood-forming organs was seriously reduced.

Both normals and anemics were able to increase erythrocyte numbers under reduced air pressure, and both were able to return to normal under normal conditions of air pressure. The anemic mice recovered from blood loss the same as normals, but the use of liver extract was ineffective.

[Papers on poultry genetics presented at the Seventh World's Poultry Congress] (*7. World's Poultry Cong. and Expo., Cleveland, 1939, Proc., pp. 39–121, 462–466, figs. 11*).—The following papers were presented:

Contributions of Genetics to Practices in Poultry Breeding, by D. C. Warren (p. 39) (Kans. State Col.); The Inheritance of Deformation of the Pelvis Bone in Fowls, by P. Carstens and J. Prüfer (pp. 39–42, Eng. abs. p. 42); Variations of and Selection for Cerebral Hernia in Fowls, by A. Ghigi (pp. 42–45); Results of Five Years of Selection for Viability in Poultry Flocks, by D. R. Marble (pp. 46–48) (Pa. Expt. Sta.); Reduction of Mortality in Fowls by Breeding, by F. B. Hutt, J. H. Bruckner, and R. K. Cole (pp. 49–51) (Cornell Univ.); Nature of the Hereditary Factors for Resistance and Susceptibility to Pullorum Disease in the Domestic Fowl, by E. Roberts, J. M. Severens, and L. E. Card (pp. 52–54) (Univ. Ill.); A Semilethal Factor in Chickens Causing Misplacement of the Vertebrae and Pelvis, by M. Czaja (p. 55, Eng. abs. p. 55); Genetic Aspects of Egg Weight Observed During Inbreeding Experiments, by N. F. Waters (pp. 55–58) (Iowa Sta.); Crossbreeding in the Domestic Fowl, by C. W. Knox (pp. 58–61) (U. S. D. A.); Lateral Asymmetry in the Fowl, by F. A. E. Crew and S. S. Munro (pp. 61–64); Comparative Investigation on the Reliability of Progeny Performance With the Help of the Production of Ancestors and Sibs, by H. F. Krallinger (pp. 64–67, Eng. abs. p. 67); Heritable Body Shape of the Domestic Turkey, by R. G. Jaap, R. B. Thompson, and T. T. Milby (pp. 68–70) (Okla. Sta.); Absence of Linkage Between Genes for Early Sexual Maturity and Genes for High Persistency in Egg Production in the Domestic Fowl, by F. A. Hays (pp. 70–72) (Mass. State Col.); Inheritance of High Color in Poultry, by L. Weinmiller (pp. 72–75, Eng. abs. pp. 74, 75); Present Status of Poultry Physiology, by T. C. Byerly (pp. 75, 76) (Univ. Md.); Artificial Insemination of Chickens With Semen Diluted in Ringer Solution, by G. Bonnier and S. Trulsson (pp. 76–79); Artificial Insemination of Birds, by T. Bonadonna (pp. 79–82); Artificial Insemination of Chickens and Turkeys, by W. H. Burrows and J. P. Quinn (pp. 82–85) (U. S. D. A.) (E. S. R., 81, p. 773); Allometric Studies of Poultry, by I. M. Lerner (pp. 85–88) (Univ. Calif.); Effect of Three Environmental Variables on Growth and Sexual Development of Chickens, by E. W. Callenbach and J. E. Nicholas (pp. 89–91) (Pa. State Col.); Effect of Androgens on the Chick, by W. R. Breneman (pp. 91–95); Formation of the Egg in the Oviduct of Birds—Observations on Turkeys, by V. S. Asmundson (pp. 96–99) (Univ. Calif.); Rate of Egg-Shell Formation in the Hen, by B. R. Burmester, H. M. Scott, and L. E. Card (pp. 99–101) (Univ. Ill. and Kans. State Col.); Effect of Resection of the Albumen Tube on Secretion of Egg White, by H. M. Scott and B. R. Burmester (pp. 102–106) (Kans. State Col. and Univ. Ill.); Plumage Reactions to Theelin in Thyroidectomized Fowl, by R. M. Fraps and W. H. Burrows (pp. 106–109) (U. S. D. A.); Hormonal Regulation of Molt and Ovulation, by J. B. Van der Meulen (pp. 109–112); Relation of Blood-Lipid Level to Reproduction in the Domestic Fowl, by F. W. Lorenz (pp. 113–115) (Univ. Calif.); Hematological Change in the Setting Hen, by K. Kakara and M.

Kawasima (pp. 115, 116); Influence of a Sojourn in the Mountains on the Blood Composition, Body Development, and Egg Production of White Leghorn Pullets, by V. Vezzani (pp. 117–119); Hematological Studies on the Polish Green-Footed Fowl, by W. Herman (pp. 119–121, Eng. abs. p. 121); and The Origin of the Domestic Pigeon, by L. J. Cole (pp. 462–466) (Wis. Sta.).

Other portions of these proceedings have been noted (E. S. R., 81, p. 465; 82, pp. 94, 257).

Multiple alleles and sex determination in Habrobracon, C. H. Bostian (*Genetics, 24 (1939), No. 6, pp. 770–776*).—Snell's hypothesis of multiple factors for sex determination in Habrobracon[1] seems highly improbable because of a failure to establish a strain free of linkage between the factor *fu* (for fused antennae) and the sex factors and the consistent lack of any diploid ♂♂ when linkage is not present. The data fit well into the scheme of multiple allels, with femaleness depending on heterozygosity and diploid maleness on homozygosity.

Quantitative results of ovariectomy in immature and adult albino rats, C. R. Freudenberger and E. I. Hashimoto (*Soc. Expt. Biol. and Med. Proc., 41 (1939), No. 2, pp. 530–532*).—The effects of ovariectomy at 25 and 177 days were compared in two groups of ♀ rats. There was a close parallelism between the results from the two groups in spite of the difference in age at the time the ovaries were removed. It seemed clear that the important changes resulting from castration occurred relatively early in the postoperative period.

The ovary of the adult rat.—1, Changes in growth of the follicle and in volume and mitotic activity of the granulosa and theca during the estrous cycle, C. E. Lane and F. R. Davis (*Anat. Rec., 73 (1939), No. 4, pp. 429–442, figs. 4*).—By determining the volume of the granulosa, theca, and antrum cells in the ovaries of adult rats, it has been found possible to estimate growth and changes during the oestrous cycle. Females showing regular cycles were killed at various stages, and the ovaries were histologically studied. These results suggested that during dioestrus the ovary is subject to stimulation by the follicle-stimulating hormone. Follicles smaller than 200μ in diameter were inactive mitotically, but above this size they were found to be on the way to maturation or atresic degeneration. The size of the cells in different regions is discussed.

Effect of opening the ovarian bursa on fecundity in the albino rat, G. L. Kelly. (Univ. Ga.). (*Anat. Rec., 73 (1939), No. 4, pp. 401–405*).—Opening the ovarian bursa in the rat on one side was found to lower fecundity distinctly on that side.

Normal development and regression of the prostate gland of the female rat, D. Price (*Soc. Expt. Biol. and Med. Proc., 41 (1939), No. 2, pp. 580–583*).—The prostate was found to grow and develop in normal ♀ rats much as it does in castrate ♂♂. However, in both, regression occurs in about 40 days.

Uterine distention and maintenance of pregnancy following oöphorectomy in the rat, H. O. Haterius and M. J. Kempner (*Soc. Expt. Biol. and Med. Proc., 42 (1939), No. 1, pp. 322–325*).—Pregnancy was maintained in the rat after removal of one ovary and the removal of the fetuses except the placentae and the later removal of the other ovary. The fetuses removed were replaced by equivalent masses of malleable wax or paraffin. Expulsion of the fetuses followed in case both ovaries were removed at once or in case no placentae were left attached. Combined hormonal and mechanical action of the intact placentae and the pellets is suggested as maintaining pregnancy.

Studies on the cause of increased growth during pregnancy, G. H. Hart and H. H. Cole (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc., 41 (1939),*

[1] Natl. Acad. Sci. Proc., 21 (1935), No. 7, pp. 446–453.

No. 2, pp. 310-313, fig. 1).—Pseudopregnant rats were found to gain as rapidly as normally pregnant ♀♀ (E. S. R., 80, p. 608). Thus the fetus and its membranes seem responsible only in part, if at all, for the increased weight of pregnant animals. Progesterone did not stimulate appetite, but appetite was stimulated by castration, although the increase did not occur until the sixth day, as contrasted with the second day in pregnant animals.

On the relation between thyroid and sex gland functioning in the Brown Leghorn fowl, A. W. Greenwood and J. P. Chu (*Quart. Jour. Expt. Physiol. and Cog. Med. Sci., 29 (1939), No. 2, pp. 111-119, figs. 2*).—Sexual growth of the comb was completely inhibited in thyroidectomized ♂ and ♀ Brown Leghorns, but two of the four ♀♀ laid. In the ♂♂ spermatogenesis was never completed, sexual growth of the comb of young ♂♂ was checked, and regression in the size of the comb occurred. Feeding thyroid powder induced comb growth in both sexes and laying in ♀♀. Male hormone preparations caused comb growth, showing that the sensitivity of the comb was not diminished if thyroid was furnished.

Lactogen content of female guinea pig pituitary, R. P. Reece. (N. J. Expt. Stas.). (*Soc. Expt. Biol. and Med. Proc., 42 (1939), No. 1, pp. 54-56*).—As it was pointed out (E. S. R., 78, p. 323) that pituitary glands of lactating guinea pigs contained more lactogen than was present in mature, nonpregnant, and nonlactating animals, the lactogen content of guinea pigs at differet stages of the oestrous cycle was determined. The results showed more lactogen in the glands of lactating than nonlactating animals, but otherwise no differences were apparent.

Hypersecretion of gonadotropic hormone of pituitary gland of rats resulting from treatment with antigonadotropic serum, R. K. Meyer and H. S. Kupperman. (Univ. Wis.). (*Soc. Expt. Biol. and Med. Proc., 42 (1939), No. 1, pp. 285-288*).—Following a short treatment of rats with antigonadotropic rabbit serum, there was a hypersecretion of gonadotropic hormone from the pituitary gland. The precocious development of the ovaries of treated rats is thought to occur because the gonads receive little, if any, stimulation and consequently produce little gonadal hormone, resulting in increased production by the pituitary as in castration. The antigonadotropic hormone renders the gonads ineffective, and they remained atrophied. Subsequent enlargement of the ovaries followed discontinuation of the antigonadal hormone.

The interrelationship of the pituitary gonadotropic hormones in follicular development and ovulation of the juvenile rabbit, M. A. Foster and H. L. Fevold (*Amer. Jour. Physiol., 121 (1938), No. 3, pp. 625-632, figs. 2*).—Study is reported of the effects of mixtures of various pituitary gonadotropic hormones on the development of the follicles and ovulation in the immature rabbit. Subcutaneous administration of purified follicle-stimulating hormone for 5 days followed by small intravenous doses of luteinizing hormone caused spontaneous ovulation. The use of larger doses of luteinizing hormone caused atresia, cystic degeneration, and luteinization; and experimental ovulation always failed. Intravenous administration of follicle-stimulating hormone alone generally induced ovulation if the follicles had been properly developed. Using sheep pituitaries for intravenous injections, the authors found the average number of ovulation points to be 22, but with horse preparations the average was 38 and with swine extracts only 7. Higher doses of the follicle-stimulating hormone given intravenously reduced the number of ovulation points. Only from 2 to 4 follicles were ovulated after extracts of pregnant-mare serum were administered. Pregnancy-urine preparations were unsatisfactory for follicular development, but could be satisfactorily substituted for luteinizing hormone in the intravenous mixture.

The differential action of pituitary gonadotropic hormones upon the secretory capacity of the Graafian follicle and corpus luteum, M. A. Foster (*Amer. Jour. Physiol., 121 (1938), No. 3, pp. 633–639, figs. 2*).—Administration of follicle-stimulating hormone to juvenile rabbits stimulated secretion of oestrin. Treatment with luteinizing hormone resulted in luteinization, with the uterus becoming characteristic of pseudopregnancy. Follicle-stimulating hormone plus a trace of luteinizing hormone caused spontaneous ovulation unless the dose of luteinizing hormone was too large. With juvenile rabbits, artificial pseudopregnancy lasted from 13 to 14 days; but the duration was shortened to 6 days by the administration of follicle-stimulating hormone, and luteinizing hormone shortened it to 9 days. Implantation was prevented in adult ♀♀ by a combination of follicle-stimulating and luteinizing hormones.

***Gonadotropic hormones.*—VII, Influence of length of period of administration of equine hormone,** C. F. Fluhmann (*Soc. Expt. Biol. and Med. Proc., 41 (1939), No. 2, pp. 313, 314, fig. 1*).—In continuation of this series (E. S. R., 82, p. 35), ovaries of about the same weight were obtained in immature rats whether injections of equine gonadotropic hormone were administered over 5-, 10-, or 15-day periods. As the period of injection was prolonged, there was a progressive increase in uterine weight.

Comparative effects of certain gonadotrophic extracts on the ovaries of normal and hypophysectomized rats, R. L. Noble, I. W. Rowlands, M. H. Warwick, and P. C. Williams (*Jour. Endocrinol., 1 (1939), No. 1, pp. 22–35, pls. 2, fig. 1*).—Gonadotropic extracts from the pituitaries of various species, including man, pig, sheep, ox, and gelding, as well as urine and serum from pregnant and ovariectomized women and pregnant-mare serum, were compared as to their potency on immature normal and hypophysectomized rats. In general, with the extracts of animal pituitaries the weights of the ovaries and uteri of both hypophysectomized and normal ♀ rats were stimulated less in the hypophysectomized than in the normal animals, except with the extracts of the pituitaries of the gelding, which caused ovulation and luteinization in both types of test animals. Follicular growth was caused by human pituitaries in both normal and hypophysectomized rats, but luteinization occurred only in the ovaries of intact ♀♀. Smaller amounts of the antihormone serum seemed needed to neutralize gonadotropic serum in hypophysectomized test animals than in normals. A definite species specificity was noted in some species for the antiserum behavior.

Factors influencing the augmentation effects produced by zinc or copper when mixed with gonadotropic extracts, F. Bischoff (*Amer. Jour. Physiol., 121 (1938), No. 3, pp. 765–770*).—In studying the augmentation effect of zinc and copper on gonadotropic extracts, the author mixed 1 mg. of pituitary powder with 0.5 mg. of zinc or copper sulfate and administered the mixture on 4 successive days to immature rats, with autopsy on the sixth. Normally, the ovarian weight is 12±2 mg., but with the extract the ovaries averaged 17±1. When copper and zinc, respectively, were used as synergists, the ovarian weights were increased to 81±12 and 37±5 mg., respectively. Zinc produced greater augmentation when the solutions were more alkaline. On the other hand, the synergistic influence of copper was not affected by small changes in pH. Injection of the salts separately and at a site removed from the site of the gonadotropic extract injection showed no augmenting properties. The degree of augmentation was related in part to the site and method of administration.

Placental activity in the mouse in the absence of the pituitary gland, W. H. Newton and N. Beck. ([Conn.] Storrs Expt. Sta. et al.). (*Jour. Endocrinol., 1 (1939), No. 1, pp. 65–75, pl. 1, figs. 2*).—In the pregnant mouse,

hypophysectomy does not cause abortion as readily as ovariectomy, but the presence of the placentae was found to prevent loss in body weight and prevent resorption of the symphysis pubis. The placentae also have a trophic influence on the mammary glands which is independent of the ovaries and pituitary.

The effects of extracts of pregnant mare serum and human pregnancy urine on the reproductive system of hypophysectomized male rats, S. H. Liu and R. L. Noble (*Jour. Endocrinol., 1 (1939), No. 1, pp. 7–14, pl. 1*).—The relative efficiency of extracts of pregnant-mare serum and human pregnancy urine to maintain and restore the reproductive system of hypophysectomized adult ♂ rats was compared. The treatments were begun immediately after hypophysectomy and at 2 and 4 weeks later in three series of rats hypophysectomized at from 2.5 to 3 mo. of age. The experimental results showed that normal growth in the testicle and accessory organs, as well as spermatogenesis, were stimulated by the treatment with pregnant-mare serum initiated immediately after hypophysectomy. However, pregnancy-urine extracts were ineffective in comparable doses. When delayed for from 2 to 4 weeks, pregnant-mare serum seemed to be more effective than pregnancy-urine extracts as interstitial cell stimulators, but the reverse occurred in spermatogenic stimulation.

The effects of extracts of pregnant mare serum and human pregnancy urine on the reproductive system of hypophysectomized female rats, S. H. Liu and R. L. Noble (*Jour. Endocrinol., 1 (1939), No. 1, pp. 15–21*).—Treatment of hypophysectomized ♀ rats similar to that used in the above study with extracts of pregnant-mare serum and pregnancy urine was followed by restoration of the ovaries and uteri for short periods, but regression followed with continued treatment.

Some effects of menopause urine extract on sexual organs of immature female cats, W. F. Starkey and J. H. Leathem (*Soc. Expt. Biol. and Med. Proc., 41 (1939), No. 2, pp. 503–507, figs. 7*).—Response by increase in weight in the ovary and follicle and lutein stimulation were noted in five of eight immature cats from injections of menopause-urine extract. Variations in the response seemed related to some property peculiar to the individual ovary.

Mammary growth in male mice receiving androgens, estrogens, and desoxycorticosterone acetate, J. Van Heuverswyn, S. J. Folley, and W. U. Gardner (*Soc. Expt. Biol. and Med. Proc., 41 (1939), No. 2, pp. 389–392*).—Various oestrogenic and androgenic substances dissolved in sesame oil were administered to 16- to 25-gm. mice on 8 alternate days. The greatest responses occurred in mice which had received androstenedione (8 mg.), desoxycorticosterone acetate (4 mg.), 9,10 dihydroxy 9,10 di-n-propyl 9,10-dihydro-1,2,5,6 dibenzanthracene (1 or 0.5 mg.), or triphenylethylene (10 or 5 mg.).

Effects of androgenic sterols in hypophysectomized and in castrated rats, E. Cutuly, D. R. McCullagh, and E. Cutuly (*Amer. Jour. Physiol., 121 (1938), No. 3, pp. 786–793*).—Varying degrees of tubular maintenance and scrotal flushing were noted in the testes of hypophysectomized ♂ rats by daily injections of several different androgenic sterols for 18 days. Such treatment did not prevent atrophy of the interstitial cells. Some evidence indicated that the testes in hypophysectomized rats in some way augmented the androgenic effect of these sterols. Large doses failed to stimulate testes that had undergone involution.

Penetration of sesame oil painted on the capon comb, D. Soloway, L. P. Hansen, and J. F. McCahey (*Soc. Expt. Biol. and Med. Proc., 41 (1939), No. 2, pp. 547–551*).—Study was made of the time of action of androgenic hormones from human urine injected or absorbed from sesame oil on the comb of fowls. The action on the comb was apparent in 24 hr., suggesting rapid absorption from

the surface which is more in accord with the physiological requirements of the bird.

Dose-response relationship of androsterone by direct application to the capon's comb, S. R. Hall and L. P. Dryden. (U. S. D. A.). (*Soc. Expt. Biol. and Med. Proc., 41 (1939), No. 2, pp. 378–382, figs. 3*).—The capon comb response from different doses of androsterone applied by inunction was found to be a logarithmic function of doses from 0.125γ to 4γ.

The effects of various gonadotropic substances upon the ovaries, pituitaries, and adrenals of animals receiving long-term injections of estrin, J. T. Diaz, D. Phelps, E. T. Ellison, and J. C. Burch (*Amer. Jour. Physiol., 123 (1938), No. 3, pp. 794–799, fig. 1*).—In studies of the effects of gonadotropic hormones it was found that daily injections of 200 rat units of oestradiol benzoate for from 60 to 70 days into ♀ rats caused a decrease in the size of the ovaries, and no mitosis and follicular atresia were observed. On the other hand, the follicular growth and luteinization of the ovaries were stimulated by the administration of a gonadotropic extract in addition to the oestradiol. The results indicated that the oestrin acts directly on the pituitary, causing exhaustion of gonadotropic hormone production, but the ovary is not fundamentally damaged but becomes atrophic because of inadequate stimulation. The adrenals were not significantly changed by the treatment.

Andromimetic effect of estrogen upon the clitoris of the rat, C. D. Turner and W. L. Burkhardt (*Soc. Expt. Biol. and Med. Proc., 42 (1939), No. 1, pp. 267–270, figs. 3*).—A defect in the external genetalia of ♀ rats involving cleavage of the preputial fold, hypertrophy of the glans clitoridis, and some differentiation of erectile tissue was induced by the administration of oestrogen during the first week of postnatal life.

Intersexuality in adult Brown Leghorn male as a result of estrogenic treatment during early embryonic life, L. V. Domm (*Soc. Expt. Biol. and Med. Proc., 42 (1939), No. 1, pp. 310–312*).—A total of 410 Brown Leghorn eggs were treated with oestrogens prior to sex differentiation. Sixty-nine of the eggs hatched, with the ♂♂ exhibiting sexual transformation, although the potential sexes could invariably be distinguished between birds. Striking modifications of the reproductive system were noted on post-mortem examination, among which were flattening of the left testis so that it resembled an ovary. Histological study was made of the ovotestes found.

Depression of hypophyseal activity by the implantation of tablets of oestrone and oestradiol, R. Deanesly (*Jour. Endocrinol., 1 (1939), No. 1, pp. 36–48, fig. 1*).—The effects of oestrone and oestradiol on growth of mice and rats when implanted in tablet form under the skin for from 10 to 270 days were investigated. This treatment led to a marked depression of the growth rate, loss of fertility, shrinkage of gonads and accessory organs, and enlargement of the adrenals and pituitary gland. The rate of absorption of the tablets was investigated, and when removed the possible changes were induced.

An assay method for progesterone based upon the decidual reaction in the rat, E. B. Astwood (*Jour. Endocrinol., 1 (1939), No. 1, pp. 49–55*).—A method for assaying progesterone was developed, based on the determination of the development of deciduoma in ♀ rats rendered pseudopregnant and the endometrium scratched. The degree of decidual response when progesterone was administered served as a measure of the potency of the progesterone. A total dose of 0.75 mg. of progesterone produced a normal 1-day-old (2 plus response) deciduoma.

An apparent sex-specificity in the action of progesterone on adrenalectomized cats, E. L. Corey (*Soc. Expt. Biol. and Med. Proc., 41 (1939), No. 2,*

pp. 397, 398).—Studies with adrenalectomized cats showed that injection of progesterone into ♂♂ was an adequate replacement therapy in the absence of the adrenal cortex, restoring normal carbohydrate levels. On the other hand, nonpregnant ♀♀ did not show favorable response to progesterone treatment.

Some effects of testosterone on sexual differentiation of female albino mice, C. D. TURNER, R. HAFFEN, and H. STRUETT (*Soc. Expt. Biol. and Med. Proc., 42 (1939), No. 1, pp. 107–110*).—The administration of testosterone to ♀ mice after birth caused an enlargement of the clitoris, with other modifications of the vaginal tract, including opening of the uterovaginal canal into the prostatic urethra. The most pronounced modifications were noted when the hormone was administered between the tenth and fourteenth days of pregnancy. The Wolffian duct derivatives persisted, and the vaginal differentiation was inhibited. Stimulation from prenatal, as well as postnatal, injections induced formation of atrophic ovaries and atretic follicles.

The effect of testosterone propionate on gonadal development and gonadotropic hormone secretion in young male rats, C. BIDDULPH. (Univ. Wis.). (*Anat. Rec., 73 (1939), No. 4, pp. 447–463, pl. 1*).—Using the parabiosis technic, the author found that the pituitary glands of ♂ rats injected daily from birth with 10γ of testosterone propionate failed to show hypersecretion, while those of the controls, or rats injected with 2γ, did show castration effects. Testosterone injections inhibited the growth of the testicles and the formation of sperm. The size of the accessory glands was also reduced. Subsequent injections with pituitary extracts greatly stimulated the accessory and interstitial tissues.

Effect of testosterone propionate on behavior of the female canary, H. H. SHOEMAKER (*Soc. Expt. Biol. and Med. Proc., 41 (1939), No. 2, pp. 299–302, fig. 1*).—Administration of 0.076 mg. of testosterone daily to ♀ canaries caused suppression of ♀ reproductive functions and the initiation of singing, courtship behavior, peck-dominance, and appearance of the ♂ type of anal region, all of which are considered as ♂ traits.

FIELD CROPS

[**Field crops research in Puerto Rico in 1938**]. (Partly coop. U. S. D. A. et al.). (*Puerto Rico Sta. Rpt. 1938, pp. 72–77, 80–87*).—Reports are made on the progress of breeding and varietal work and studies of flowering, pollination, and seed production, all with sweetpotatoes; and fertilizer experiments on different soils and variety tests, both with sugarcane.

[**Agronomic investigations in Texas**], W. H. FRIEND, R. E. WRIGHT, E. B. REYNOLDS, D. T. KILLOUGH, T. R. RICHMOND, R. E. KARPER, R. H. WYCHE, H. M. BEACHELL, H. P. SMITH, D. L. JONES, J. R. QUINBY, G. S. FRAPS, R. L. HENSEL, J. H. JONES, D. A. REID, P. C. MANGELSDORF, E. S. MCFADDEN, R. G. REEVES, H. E. REA, J. E. ROBERTS, W. H. DAMERON, E. C. TULLIS, C. H. MCDOWELL, C. H. ROGERS, I. M. ATKINS, P. B. DUNKLE, R. E. DICKSON, B. C. LANGLEY, C. E. FISHER, E. K. CROUCH, J. C. STEPHENS, V. L. CORY, L. E. BROOKS, and E. MORTENSEN. (Partly coop. U. S. D. A. et al.). (*Texas Sta. Rpt. 1938, pp. 27, 30, 31, 48–63, 64–67, 69–71, 108, 123–126, 129, 130, 137–142, 144–149, 151, 159, 160, 161–164, 166, 167, 168–176, 179–181, 184–187, 189, 191–193, 194, 202–209, 211, 212, 221–223, 224, 229, 232, 233, 245–250, 261*).—Agronomic work and plant breeding (E. S. R., 81, p. 36) at the station and substations again reported on briefly included varietal tests with cotton, corn (and corn hybrids), wheat, oats, barley, rice, grain sorghum, sorgo, sugarcane for sirup, flax, soybeans, alfalfa, clover, bur clover, sweetclover, crotalaria, potatoes, sweetpotatoes, and miscellaneous

winter and summer legumes and grasses; tests of perilla and chia; growing of spineless cactus (*Opuntia ellisiana*) on bitterweed range; breeding work with cotton, wheat, oats, barley, corn, sweet corn, rice, grain sorghum, Sudan grass, sorgo, broomcorn, sorghum for popping, cowpeas, buffalo grass, and peanuts; development of cotton varieties adapted to mechanical harvesting; composition of seed of different cotton varieties; inheritance studies with cotton, corn, broomcorn, and different sorghums; studies of the genetic and cytological relationships of corn, *Euchlaena*, and *Tripsacum*; hybrid vigor in sorghum; cultural (including planting) tests with cotton, corn, wheat, rice, grain sorghum, Sudan grass, buffalo grass, blue grama, flax, soybeans, sweetclover, and sweetpotatoes; effects of different plant spacings upon cotton yield, maturity, and fiber length; treatment of cottonseed; root initiation of cotton plant material by the use of hormones; seedbed preparation studies; comparisons of corn and sorghums and their effects on succeeding small grain crops; forage yields of corn, sunflower, and sorghum varieties; irrigation tests with grain sorghum and cotton; studies of artificial plats for field experiments in soil improvement; crop rotation and sequence experiments; fertilizer tests with crops in rotation, corn, wheat, oats, rice, potatoes, sweetpotatoes, grain sorghum, pasture, and cotton; methods of applying fertilizers for rice; effects of fertilizers on germination of rice seed; tolerance of rice to different soil reactions adjusted with lime and sulfur; polyhalite as a source of potassium for cotton fertilizers; nitrogen carriers for cotton and corn; cotton burs v. manure as cotton fertilizers; turnips, mustard, collard, and rape as winter cover crops and green manure; hairy vetch and other green manures for cotton and other crops; inoculation studies with soybeans and other legumes; rice weed control with sulfuric acid solutions; soil fertility and improvement studies; germination, longevity, and dissemination of the seed and control of bitterweed; control of pricklypear and pasture weeds; production and germination of buffalo grass seed, ratios of male, female, and monoecious plants and composition of buffalo grass strains, and establishment of buffalo grass pasture; and other pasture improvement and management investigations concerned with plants and seeds mixtures for different types of pasture, effects of fertilizer treatments on yield and chemical and botanical composition of herbage, introduction of new grasses and legumes and seeds for observation, grazing tests with new grasses, combination woodland and pasture studies, different rates of phosphate on strains of Subterranean clover, effects of fertilizers on establishment and survival of clovers on native pasture, studies of range vegetation, and influence of deferred grazing on yield of pasture grasses and increase of desirable winter-growing range plants.

[Forage crops investigations in Wales] (*Welsh Jour. Agr., 14 (1938), pp. 160–246, 277–280, pls. 2, figs. 4*).—Further studies (E. S. R., 78, p. 474) are reviewed in articles entitled The Effect of Partial Field-Drying and Artificial Drying on the Chemical Composition of Grass, by T. W. Fagan and W. M. Ashton (pp. 160–176); Pasture Improvement and the Eradication of Bracken and Rushes, by M. Griffith (pp. 176–181); The Composition of Natural Hill Pastures Under Controlled and Free Grazing, Cutting, and Manuring (pp. 182–195), The Yield of Certain Miscellaneous Herbs Compared With Grasses When Grown in Drills (pp. 196–202), and A Comparison of the Herbage Yields From Broadcast Plots Versus Cultivated Drills of Certain Species and Strains of Grass (pp. 203–212), all by W. E. J. Milton; The Moisture Content of Grass Seed in Relation to Drying and Storing, by M. Williams (pp. 213–232); The Rapid Determination of Moisture Content in Grass Seeds, by M. Williams and G. Evans (pp. 232–244); Notes on the Shoot-Bud Prophylls of Certain *Phleum*, *Alopecurus*, *Agrostis*, and *Holcus* spp., by A. R. Beddows (pp. 245, 246); and

The Use of Sodium Chlorate for Destroying Some Perennial Weeds, by J. Rees (pp. 277–280).

Fertilizer response and requirements for profitable crop production in the Yazoo-Mississippi Delta, R. KUYKENDALL (*Mississippi Sta. Bul. 333 (1939), pp. 11, figs. 9*).—Fertilizer experiments with cotton, corn, and oats by the Delta Substation indicated that soils on the west side of the Delta respond to nitrogen only, while most soils on the east side respond to nitrogen, potash, and phosphorus. From 30 to 40 lb. of nitrogen per acre was the most practical rate. Usually the nitrogen can be applied on heavy soils from late fall to 3 weeks before planting and on lighter soils in the spring up to 10 days before planting with slight difference in yields of seed cotton and corn, and any time from fall to March 15 for oats. Cotton yields obtained from various placements differed little so long as the fertilizers were mixed in the seedbed before planting.

Harmful root interactions as a possible explanation for effects noted between various species of grasses and legumes, H. L. AHLGREN and O. S. AAMODT. (Wis. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 11, pp. 982–985*).—That harmful root interactions might occur between species of pasture grasses and legumes was indicated by reduced dry weights, and in some cases root weight, of grasses grown in combinations. When several grasses were grown under various soil treatments and managements, including the seeding of a clover mixture across the grass plats, Kentucky bluegrass was practically eliminated when grown in association with clovers, while bromegrass strains and timothy were not affected. Grown in pure cultures, the plant weight average of redtop was 0.369 gm., Kentucky bluegrass 0.343, Canada bluegrass 0.450, and timothy 0.577 gm. In combinations, however, the weights averaged timothy 0.360 gm. and redtop 0.294, Kentucky bluegrass 0.195 and redtop 0.311, and Canada bluegrass 0.260 and Kentucky bluegrass 0.264 gm.

Some effects of contour listing on native grass pastures, B. C. LANGLEY and C. E. FISHER. (Tex. Expt. Sta. and U. S. D. A.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 11, pp. 972–981, figs. 2*).—When grassland with a cover primarily of buffalo grass was solid-listed 3 in. deep on contours, grass yields increased as much as 3.9 times, with a maximum annual yield of 2,424 lb. of air-dry grass per acre. Gains in available soil moisture and depth of penetration were reflected in higher grass yields, greater basal cover, and a tendency of listed areas to remain green longer during droughty periods. The large increase in buffalo grass cover, accompanied by a marked decrease in weed cover and area of bare soil, was the most important vegetal change. Greater volume and deeper penetration of roots, growing vigorously, occurred on listed grassland, while a high percentage of roots on unlisted grassland appeared to be dead.

Use of fertilizers and lime on native pastures in Michigan, J. TYSON (*Michigan Sta. Tech. Bul. 167 (1939), pp. 32, figs. 17*).—The average annual yield of pasture forage was about doubled by 500 lb. per acre of fertilizer high in nitrogen, such as 10–6–4, 10–12–4, and 10–10–5. In general, superphosphate, potash, and lime had little effect on growth of grass in the pastures except in combination with nitrogen. In the two instances when phosphate and potash stimulated growth of clover, resulting in greatly increased production, the improvement was only temporary as the clover disappeared before midsummer. Weather influenced greatly the forage available for livestock on permanent bluegrass pastures. The maximum growth of grass and forage production was in the spring and fall months when the temperatures were moderate and moisture plentiful, and it was then that fertilizer treatments were most effective. Growth of the grass was inhibited by moisture shortage in July and August,

and the grass on fertilized plats which had made most rapid growth up to this time showed drought injury several days earlier and made no larger growth than did grass on unfertilized soil. The grass from fertilized plats contained higher percentages of water than grass from unfertilized plats, with the greatest differences in clippings taken in early spring and late fall.

The nitrogen content of the dry material produced on the plats which received the heaviest nitrogen fertilization was greater than that from the other plats. Applications of superphosphate tended slightly to decrease the percentage of nitrogen in the grass, but potash and lime had no influence. The percentage of nitrogen in the grass on the College Farm dairy pasture on the basis of dry matter was highest in clippings taken early in spring and late in fall, but on the basis of green material or feed standing in the field was highest in midsummer and lowest in the spring and fall. The nitrogen content of the heavily fertilized grass was higher than was that of the unfertilized.

The percentages of calcium in green and dry material were not consistently affected by fertilizer and lime, although there was a tendency for low calcium content to be associated with high yield. Calcium content was lowest in early spring, gradually rose to a maximum in August, and decreased in the fall.

With exceptions, application of fertilizer containing phosphorus or phosphorus and potash generally resulted in a higher percentage of phosphorus in the dry grass than did fertilizer containing nitrogen also. Lime, in addition to fertilizer, tended slightly to decrease the phosphorus content of the dry grass. The percentage of phosphorus in dry material from the College Farm dairy pasture was higher in the spring and fall than in midseason, but the reverse was true in the green material. It was higher in dry material from fertilized plats than from unfertilized plats at the time of first clippings in spring. During midsummer and fall it was either about alike in both plats or higher in dry unfertilized material plat. In green material, the percentages of phosphorus were usually higher in the unfertilized grass.

Nitrogen was removed from the soil by native grasses in the greatest quantities, and it must be supplied in the greatest amounts for continued productivity of pastures. Phosphorus was removed in fairly large amounts, but calcium was removed in only small quantities. Practical suggestions are based on these findings.

Small grain production in the Yazoo-Mississippi delta, R. Kuykendall (*Mississippi Sta. Bul. 334 (1939), pp. 19, figs. 8*).—Experiments with small grain at the Delta Substation since 1921 are reviewed and interpreted. Brief comments on soil improvement, control of oat smut and armyworm, and on pure seed are appended.

Varietal leaders over long periods included the Red Rustproof oats strains, including Ferguson 922, Nortex, Delta Station selection, Hastings 100 Bushel, Appler, and Baylis, and among the earlier oats Fulgrain, Fulghum, and Kanota; and Abruzzi rye; and in recent years Purple Straw, Red Hart, and Gasta wheat, and Texas Winter, Wintex, and Harlan Hybred barley. Indicated practices were the seeding of from 9 to 12 pk. of oats per acre about October 15 and applying 30 lb. of nitrogen per acre about March 15. Sodium nitrate slightly surpassed other nitrogen carriers. Oats and corn, when both were fertilized, made similar weights of grain per acre, but with no fertilizer oats yields were much lower than corn yields.

Breeding small-seeded legumes and grasses—a challenge to seed producers, H. K. Hayes. (Minn. Expt. Sta.). (*Seed World, 46 (1939), No. 13, pp. 5–7, 27, fig. 1*).—Accomplishments in crop plant breeding by the State experiment stations and the U. S. Department of Agriculture are reviewed, with dis-

cussion of current problems and research on the breeding of small-seeded legumes and grasses and on the increase and distribution of the improved strains.

Progress report on the breeding of abacá (Musa textilis Nee), J. P. Torres and T. G. Garrido (*Philippine Jour. Agr., 10 (1939), No. 3, pp. 211–231, pls. 5*).—The history of abacá breeding since 1906 is reviewed, the technic of abacá hybridization is outlined, and recent work is reported on. Results of seven different matings showed that Canton, a pollenless and seedless form of *Musa*, is cross-sterile with abacá used as pollen parent. Heterosis was observed in the F_1 hybrid of abacá crosses, which produced more suckers than either parent, gains ranging from 46.7 to 85.1 percent. The Maguindanao hybrids are better adapted to conditions and possess stronger root systems than the Maguindanao variety and have potential value in the abacá industry. Their hybrids with the Putian variety are being studied for resistance to bunchy top disease.

The maternal-line selection method of breeding for increased seed-setting in alfalfa, J. R. Fryer (*Sci. Agr., 20 (1939), No. 2, pp. 131–139, fig. 1*).—In 3-yr. tests at the University of Alberta, alfalfa stock for 10 yr. under the maternal-line selection method of improvement described showed very decided superiority in fertility over ordinary unimproved Grimm, Ladak, and Cossack alfalfas and a selfed line. Selection for high seed-setting capacity did not result in reduction of hay-yielding ability.

Viability of pollen and ovules of barley after cold storage, M. N. Pope (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 59 (1939), No. 6, pp. 453–463, figs. 3*).—Culms of barley with spikes, some emasculated and others not, with their cut ends placed in tap water, were stored at 36°, 40°, and 50° F. for various periods, and samples were removed and pollen and ovules tested for ability to produce seed. Spikes placed in cold storage within 3 days after emasculation made the highest set of seed after return to the greenhouse and pollinated. Growth in length of culm practically ceased after from 1 to 2 days in cold storage, and elongation of anther filaments and dehiscence of anthers were largely prevented. Flower opening and closing in emasculated spikes proceeded more slowly in cold storage, slowest at 36°. Color in the culm was fast at 36° but soon faded at 50°. Spikes unemasculated set seed after 29 days at 36°, after 26 days at 40°, and after 14 days at 50°. Pollen was productive up to 26 days at 36° and 19 days at 40°, but no pollen stored 14 days or longer at 50° produced seed. The limit of storage for production of seed from stored emasculated spikes was at least 42 days at 36°, 29 at 40°, and 14 days at 50°. Seed from all these tests, with one exception, germinated and gave normal plants after 8 weeks' growth. Cold storage of undisturbed pollen or preferably of excised, emasculated spikes makes it possible to obtain viable hybrid seed between barleys normally flowering on widely separated dates.

Barley production in Washington, O. E. Barbee. (Coop. U. S. D. A. et al.). (*Washington Sta. Bul. 382 (1939), pp. 48, figs. 24*).—Comparative yields and other important varietal characteristics are tabulated and discussed for a number of barley varieties grown 1913–38 at Pullman, Walla Walla, and Pomeroy, supplementing earlier reports (E. S. R., 51, p. 338). The varieties are also arranged and compared according to plant types, and correlation coefficients between important agronomic characters are recorded.

Rufflyn, Flynn, Selection, and Coast strains 1 and 2 outyielded the six-rowed spring Beldi Giant, which is grown extensively. White Winter, a six-rowed club barley, and Olympia, six-rowed lax, both outstanding winter strains, ranked high as malting barley. Hannchen 2911 surpassed other two-row strains and ranked with Beldi Giant. Horsford, six-rowed hooded, the best strain of its

group, yielded much less than Beldi Giant and had weak straw but is used widely for hay. Excelsior, the best yielding naked barley, made an equivalent of only 71 percent as much as Beldi Giant. Atlas, Blue, White Winter, Hannchen, and Rufflyn barleys have made excellent malt and are adapted to Washington.

Effect of removing different proportions of foliage on contrasting strains of Kentucky bluegrass, Poa pratensis L., A. O. KUHN and W. B. KEMP. (Md. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 10, pp. 892–895, fig. 1*).—When like proportions of foliage were removed from each of two strains of Kentucky bluegrass of contrasting habit in height of growth, increase in severity of defoliation caused similar and highly significant decreases in production of roots, rhizomes, and tops. On the basis of comparable height of clipping, the short-growing strain clipped either at about 1.5 in. or at 1 in. produced strikingly more tops, roots, and rhizomes than the tall-growing strain.

Strain tests of red and white clovers, O. S. AAMODT, J. H. TORRIE, and O. F. SMITH. (Wis. Expt. Sta. and U. S. D. A.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 12, pp. 1029–1037, figs. 2*).—The adaptability of domestic and foreign red and white clovers under Wisconsin conditions was studied in 63 red clover and 16 white clover strains planted in the spring of 1937 and 80 red and 20 white strains in 1938. European red clovers appeared decidedly inferior to domestic strains in ability to produce a good stand the year of seeding when drought and high temperatures prevail. The hay crop of 1938 was poor both in yield and in quality of hay, due largely to a high percentage of weeds. The average tonnage of cured hay per acre in 1938 for red clover strains from different sources was for Wisconsin 3.35, Canada 3.55, Hungary 1.03, Poland 0.77, all Europe 0.96, and all United States 3.32 tons. Superior performance indicated that Graham Mammoth is hardier under adverse conditions than the medium or two-cut types. White clover strains of different origins varied considerably in adaptability. Strains from Louisiana and New Zealand winterkilled almost completely during the winter of 1938–39.

Loss resulting from pulling leaves with the tassels in detasseling corn, G. H. DUNGAN and C. M. WOODWORTH. (Ill. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 10, pp. 872–875, fig. 1*).—An experiment in 1938 to measure the loss in grain yield resulting from careless detasseling in the commercial production of hybrid corn showed that pulling 1 leaf with the tassel reduced the grain yield 8.3 percent, 2 leaves 15.3, 3 leaves 18.1, and pulling 4 leaves reduced the yield 29.2 percent. Detasseling without removing any leaves resulted in a yield increase of 1.4 percent over nondetasseled plants. Weight of 500 kernels was reduced materially by pulling leaves with the tassel.

The relation between the moisture content and the test weight of corn, S. R. MILES. (Ind. Expt. Sta.). (*Jour. Amer. Soc. Agron., 29 (1937), No. 5, pp. 412–418, fig. 1*).—Daily tests of shelled grain of five corn varieties while drying in a warm room showed the relation between weight per measured bushel and percentage of water to differ somewhat for Krug and for White Cap, Bryant Reid, Purdue II Reid, and Johnson County White. The association was negative in the range from 10 to about 30 percent water but practically linear from 14 to 22 percent water. For each change of 1 percent in water Krug changed 0.59 lb., and the average change of the other varieties was 0.48 lb. per bushel. Addition of water to corn resulted in changes in test weight associated with changes in water content much greater than when corn was drying. It appeared desirable for the grain to contain less than 15 (or 20) percent water when tested, to have the moisture range as narrow as possible for the lots of corn to be compared, and to make all adjustments to the average percentage moisture of the lots.

The effect of "digging" and "hogging" peanuts on cotton yields (*Alabama Sta. Leaflet 18 (1939), pp. 8, figs. 6*).—In experiments at the Wiregrass Substation by J. P. Wilson, cotton did not make satisfactory yields even when receiving 600 lb. per acre of 6–8–4 or 6–8–8 fertilizer after 7 successive years of harvested peanuts or with 600 lb. of 6–8–4 in a 3-yr. rotation of corn, cotton, and harvested peanuts. However, cotton gave satisfactory yields in a similar rotation with 6–8–12 fertilizer, and also when supplied with 6–8–4 fertilizer and grown in alternation with hogged off peanuts and in 1939 given 600 lb. of 0–8–4 fertilizer. So far as soil fertility is concerned, peanuts should be harvested seldom and hogged off as often as possible.

The effect of calcium arsenate upon the yield of cotton on different soil types, C. DORMAN and R. COLEMAN. (Miss. Expt. Sta. and U. S. D. A.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 11, pp. 966–971*).—Cotton yields on Houston clay loam, Memphis silt loam, Sarpy silty clay loam, and Sarpy fine sandy loam were not affected even after an application of as much as 1,600 lb. of calcium arsenate per acre but were affected greatly on Ruston sandy loam. Beneficial effects were obtained from light applications and detrimental effects from heavy ones. However, the arsenic toxicity was reduced with time. Beneficial effects were attributed to the applied calcium acting as a nutrient, the arsenic liberating insoluble phosphorus, and the calcium arsenate stimulating bacterial action. The ability of the unaffected soils to render arsenic insoluble seemed due to their high pH and high colloidal content. The results from these soils, representative of many in the Cotton Belt, indicated that there is very little danger of reducing cotton yields on them with calcium arsenate. Since the average yearly application to cotton hardly ever exceeds 30 lb. per acre and much is lost every year, accumulation in the soils studied probably never will be enough to inhibit cotton production.

Cellulose orientation, strength, and cell wall development of cotton fibres, E. E. BERKLEY. (U. S. D. A.). (*Textile Res., 9 (1939), No. 10, pp. 355–373, figs. 6*).—The X-ray studies and determinations of tensile strength and percentage of thin-walled fibers, made largely on Mexican Big Boll cotton grown at the North Carolina Experiment Station in 1937, provided data indicating that the proportion of ordinary thin-walled fibers which usually occur in commercial cottons will not affect the application of the X-ray method for the purpose of strength estimation or prediction.

Chemical composition of diploid and tetraploid Lolium perenne L., J. T. SULLIVAN and W. M. MYERS. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 10, pp. 869–871*).—Comparison of the composition of diploid with colchicine-induced tetraploid tissue of *L. perenne* revealed that chromosomal and genic reduplication caused an increase in the sugar content. The tetraploids were, in general, lower in both soluble and insoluble nitrogen, but the differences were not significant. No consistencies were found in total dry matter and crude fiber.

Study on the vitality of old and new seeds of mungo (Phaseolus aureus Roxb), P. A. RODRIGO (*Philippine Jour. Agr., 10 (1939), No. 3, pp. 285–293, pl. 1*).—While yields of straw did not differ much, mung seed from 11 to 13 yr. old made decidedly greater yields of pods and beans than did seed 1 mo. old. This is attributed to phenomena of storage.

A comparison between yields calculated from the grain-straw ratio and those calculated from small cut-out areas, J. F. DAVIS. (Mich. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 10, pp. 832–840, figs. 2*).—Yields were secured from a series of 16 oats plats, each 14×150 ft., by (1) cutting and threshing the entire plat, (2) calculation from small areas cut out with a

hand sickle, and (3) from the grain-straw ratio (E. S. R., 78, p. 33) in a part of the plat and the bundle weight of the entire plat. Higher values for "r" and "Z" were obtained when actual plat yields were compared to yields calculated from weight relationships than from area relationships. Regression lines obtained from weight relationships compared more closely to the line Y=X than did the lines from the area methods of calculating yields, and the magnitude of the errors was considerably lower when yields were calculated from weight relationships. Calculated yields varied progressively from the actual plat yield with decrease in number of bundles weighed and with number of areas cut, but yields from 1 bundle were closer to actual plat yields than when yields were based on 6 areas. Three bundles weighed from a plat of this size apparently would give a very accurate estimate of plat yields and would be the number recommended in yield estimation. A harvested area as small as 1,000 sq. ft. has been cared for satisfactorily by this method. Compared to the method of cutting out small areas, the grain-straw ratio method of harvest is more accurate and more efficient in use of labor.

Soybeans in the Yazoo-Mississippi Delta, H. A. York (*Mississippi Sta. Bul. 331 (1939), pp. 31, figs. 6*).—Information on growing soybeans, derived from breeding work, variety tests, and planting, cultivation, and harvest experiments carried on during an extensive period at the Delta Substation, is reported, with discussion of the utilization of the crop for interplanting, hay, pasture, grain, and for soil improvement, control of diseases and insects, and the avoidance of calcium arsenate injury.

Varietal leaders include Laredo, Avoyelles, and Otootan for hay, and Mamloxi, Delsta, Tokio, Mamredo, and Mammoth Yellow for grain. Practices indicated from the experiments include planting from April 15 to June 1, unless sown earlier with corn, on a well-prepared seedbed for grain about 1 seed per inch in from 30- to 42-in. rows and covering from 1 to 1.5 in. deep, the rate per acre varying with the seed size of the variety, and for hay planting at about 3 times the rate used for grain, the heavier seeding rates making finer hay. Cultivation should be enough to suppress weeds and grass. The crop may be harvested for grain with binder or mower when two-thirds of the pods are ripe or with a combine for grain when all pods are ripe, and harvested for hay or plowed under when pods are forming.

While the information, in general, is also applicable elsewhere in Mississippi, indications were that in hill sections little soil improvement may be expected when soybeans are interplanted with corn. In areas other than the Delta the use of from 200 to 300 lb. of basic slag or from 100 to 150 lb. of superphosphate and from 40 to 50 lb. of muriate of potash per acre is recommended. Probably because of less fertile soil, row plantings have yielded better than broadcast plantings. Three selections from Mamredo have been outstanding in variety tests outside the Delta.

Soybeans in Nebraska, T. A. Kiesselbach and W. E. Lyness (*Nebraska Sta. Bul. 322 (1939), pp. 18, figs. 2*).—The characteristics and uses of soybeans, their adaptation to Nebraska, and relative merits compared with other standard farm crops are discussed, and information based largely on experiments and experience of the Nebraska and other experiment stations is given on varieties, cultural and field methods, and harvesting and storage practices. Although soybeans proved relatively well adapted to eastern Nebraska, farm trials during 35 yr. failed to bring about a large acreage because alfalfa and clover proved superior for forage production and the threshed-bean prices had been too low to attract production. Grain yields from standard adapted crop varieties at the station 1909–1938 were for soybeans 15.2 bu., corn 35.5, oats 44.1, winter wheat 29.6, and

spring wheat 15 bu., and 1924–38 for barley 28.1 and kafir 30.8 bu. Forage yields during 11 seasons averaged for soybeans 1.32 tons per acre, alfalfa 2.23, and sorgo 4.63 tons. Varieties recommended for east-central Nebraska in order of preference are Illini, Dunfield, and Manchu, all medium-late, shatter-resistant, productive, yellow, high-oil beans, and also suitable for forage production.

Soybeans in Oklahoma, J. E. Webster. (Okla. Expt. Sta.). (*1. Okla. Farm Chemurg. Conf., Oklahoma City, 1937, Proc., pp. 1–8*).—A popular account of the importance and uses of the soybean, and the yields, composition, and adaptation of the crop (E. S. R., 63, p. 36) in Oklahoma.

Varieties, production methods, yields, and storage of sweetpotatoes, W. S. Anderson. (Miss. Expt. Sta.). (*1. Okla. Farm Chemurg. Conf., Oklahoma City, 1937, Proc., pp. 1–4*).—The yields of roots and starch per acre and percentage and viscosity of starch are shown from 29 varieties and selections of sweetpotatoes grown in 1936 at Laurel, Miss. The effect of time of sampling on these characters is also shown, and improvements in production practices are indicated.

Estimation of leaf area in wheat from linear dimensions, J. W. Hopkins (*Canad. Jour. Res., 17 (1939), No. 9, Sect. C, pp. 300–304, fig. 1*).—Measurements of from 80 to 90 leaves of each of 4 spring wheat varieties at several stages of development indicated a fairly close statistical relation between area and length and width of the leaf blade, essentially the same for all 4 wheats. From a knowledge of length (L) and median width ($W_{1/2}$), the area of an individual leaf was given by the Least Squares relation log. $A=0.0094+0.934$ log. $L+1.071$ log. $W_{1/2}$ with a standard error of 4.2 percent of the antilog. Inclusion of width at three-quarters of the distance from base to tip ($W_{3/4}$) led to the relation log. $A=-0.0438+0.970$ log. $L+0.880$ log. $W_{1/2}+0.189$ log. $W_{3/4}$, giving estimated values having a standard error of 3.7 percent of the actual area per leaf. This method is rapid and does not require removal of leaves from the plants.

Milling, baking, and chemical properties of Colorado-grown Marquis and Kanred wheat stored 9 to 17 years, D. W. Robertson, C. C. Fifield, and L. Zeleny. (Colo. Expt. Sta. and U. S. D. A.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 10, pp. 851–856, figs. 2*).—Milling and baking tests were made with eight samples of Marquis wheat and three of Kanred wheat of crops, 1921–29, after storage in a dry, unheated room for periods up to 17 yr. A definite and fairly regular increase in fat acidity with storage indicated a certain amount of progressive deterioration, but satisfactory flour yields were obtained in all cases without unusual tempering. All lots made satisfactory bread, with no indications of deterioration in baking quality in any sample. The best bread from both varieties was made from the 1921 crop, but the small difference as compared with later crops could probably be attributed to higher protein content. There was no apparent relation between deterioration in viability and baking quality.

Long-time storage of winter wheat, A. F. Swanson. (Kans. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 10, pp. 896, 897*).—Turkey wheat combined in 1927 and stored until 1938 in a 1,000-bu. farm steel bin, both under good conditions in western Kansas, showed no signs of heating, insect or other damage, was of good quality, produced as good a stand at Fort Hays as new-grown Turkey seed, and in greenhouse soil germinated 53 percent. Wide climatic fluctuations, 1927–38, were never enough to cause the grain to go out of condition. Its milling and baking results compared favorably with those of adapted varieties grown in the same region in 1938.

Increase of Sporobolus cryptandrus in pastures of eastern Nebraska, J. E. Weaver and W. W. Hansen. (Univ. Nebr.). (*Ecology, 20 (1939), No. 3,*

pp. 374–381, figs. 5).—Sand dropseed (*S. cryptandrus*) seldom occurred in native pastures of eastern Nebraska before the great drought of 1934 (E. S. R., 81, p. 770) but has since increased so rapidly as to become one of the most abundant and important pasture grasses. This species renews growth in early spring, develops rapidly, and is drought-resistant, not readily injured by close grazing, and a prolific seeder, and under proper grazing soon reclaims pastures where bluegrass and little bluestem have died. It is of good palatability, produces much forage, and protects the soil against erosion.

HORTICULTURE

[**Horticultural studies by the Puerto Rico Station**] (*Puerto Rico Sta. Rpt. 1938, pp. 26–37, 46–52, 53–65, 65–69, 69–72, 78–80, 87–94, figs. 20*).—Included are reports on investigations dealing with the propagation and culture of quinine; cinnamon propagation and utilization; clove and nutmeg propagation; ginger culture; growth and fruiting habits of the Columnaris coffee variety; the growing of cut flowers; the possible value of various tropical flowers for shipment; propagation and utilization of bamboo; culture and improvement of various insecticidal plants such as *Derris elliptica* and *Lonchocarpus nicou*; the role of rotenone in the metabolism of *Tephrosia toxicaria* and *D. elliptica*; breeding, improvement, culture, and fertilization of sweet corn; effect of the treatment of sweet corn seed with arsenate of lead to control rodents and on stand, growth, and yield; effect of organic mercury dust treatments on sweet corn seed; calabaza breeding and propagation; cucumber variety trials; culture and propagation of the mango and avocado; long-distance shipment of field-ripened pineapples; and introduction and distribution of new plants, among them the tonka-bean (*Coumarouna odorata*); *Pogostemon cablin*, a perfume plant; *Victoria regia*; *Aleurites cordata*, a subtropical tung-oil producer; *A. trisperma*; *Licania rigida*; *Nephthytis afzelii*; and *Monstera deliciosa*.

[**Horticultural studies by the Texas Station**], S. H. YARNELL, J. F. ROSBOROUGH, B. S. PICKETT, J. C. RATSEK, H. F. MORRIS, W. H. FRIEND, E. MORTENSEN, J. F. WOOD, H. M. REED, R. H. STANSEL, U. A. RANDOLPH, W. S. FLORY, L. R. HAWTHORN, R. A. HALL, R. H. WYCHE, D. L. JONES, F. GAINES, J. J. BAYLES, W. H. DAMERON, and H. P. SMITH. (Partly coop. U. S. D. A.). (*Texas Sta. Rpt. 1938, pp. 21–27, 27–30, 31, 32, 128, 131, 132, 142, 143, 151, 152, 187, 188, 189, 190, 194–196, 210, 226–229, 229–232, 240–243, 250–253, 254–259*).—Brief progress reports are presented in the customary manner (E. S. R., 81, p. 41). The studies, carried on at the central and branch stations, include varietal, fertilizer, and cultural trials with fruits, vegetables, and ornamentals: low temperature requirements of the peach to insure breaking of dormancy; breeding of peaches, blackberries and related species, citrus fruits, grapes, plums, strawberries, cabbage, peas, and tomatoes, and of the oleander and holly; rootstocks for citrus; storage of citrus fruits; chromosomal numbers and behavior in citrus species; canning and freezing trials with vegetables; vegetative propagation of the oak; utilization of grape varieties for juice; culture, propagation, and storage of rose plants; selection of forest species for windbreaks and wood lots; culture and improvement of the tung tree; protectants for citrus tree wounds; papaya breeding and improvement; propagation of the avocado; culture of plants without soil; propagation of the date palm; and rootstocks for the grape.

Plant hormones and their practical importance in horticulture, H. L. PEARSE (*Imp. Bur. Hort. and Plant Crops [East Malling, Kent], Tech. Commun. 12 (1939), pp. 89*).—Essentially a review of the literature, this memorandum is designed to record the available information in a readily accessible form to

serve as a guide to those interested in the practical use of growth-promoting substances in propagation. An index arranged alphabetically by species is presented which shows some of the typical results obtained by phytohormone treatments.

Talc as a carrier of substances inducing root formation in softwood cuttings, V. T. STOUTEMYER. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 817-822*).—A comparison with a considerable number of species of growth substances in aqueous solution and applied to moistened cuttings in the form of talc dust mixtures showed, in general, that the dust treatment was as effective as the liquid treatment. The dusts were noticeably effective in promoting rooting, even at the low concentration of 250 p. p. m., although the resulting roots were few. A concentration of 1,000 p. p. m. was found satisfactory for general use. Dusts of a concentration of 4,000 p. p. m. were very effective but injured sensitive species. It was pointed out that no single concentration is ideal for all plants.

The addition of accessory materials designed to break dormancy gave promising results, particularly in the case of thiourea. Application of the dust at the basal cut and along the stem to 1 cm. above the base was found the best procedure in *Euonymus japonicus* cuttings. The advantages of the dust treatment over the solution treatment are pointed out.

Biological activity in steam sterilized soils in the greenhouse, A. LAURIE and J. B. FUEGLEIN. (Ohio State Univ.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 837-840*).—Pots of greenhouse soil used for 2 yr. for rose production were steam treated for different durations and then placed on a bench in a rose house. The moisture was maintained at about 35 percent, the air temperature at about 60° F., and the relative humidity at about 70 percent. Determinations of the numbers of bacteria, molds, and actinomycetes, made at approximately weekly intervals, showed a great reduction in all three groups which was directly proportional, in the case of the bacteria and molds, to the duration of the steaming treatment. The actinomycetes apparently were killed or rendered inactive in all the steamed samples. In the weeks following steaming, bacteria were considerably more numerous in the steamed than in the untreated soil. In the later weeks, the numbers in the 4- and 6-hour treatments were either comparable to or less than the checks, and molds were more numerous in treatments of 2 hr. and less than in the checks. In treatments of 4 and 6 hr., the numbers after 10 weeks were either comparable to or considerably less than those of the checks. The numbers of actinomycetes in soils treated 2 hr. or more either exceeded or were comparable to the checks after 10 weeks.

Further studies of vegetable plant growth as affected by the position of the hotbed heating cable, E. F. BURK and H. L. GARVER. (Wash. State Col.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 562-564, fig. 1*).—Continuing the investigation (E. S. R., 80, p. 621), the authors again found that the best results, measured in desirability for transplanting, were obtained when the heating cables were imbedded 0.5 in. below the soil surface. The plants in this lot had longer taproots, with laterals less concentrated toward the top, than was the case where the cables were suspended 2 in. above the soil. In the fourth consecutive test the seeds of the warm-season crops—tomatoes, peppers, cucumbers, cantaloups, and beans—germinated first in the 0.5-in. imbedded-cable plats.

Fertilizer trials with asparagus on peat sediment soil, G. C. HANNA. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 560, 561*).—Of various fertilizer treatments applied to asparagus replanted directly on soil which

had been in asparagus and to plants set in soil which had never been in the crop, only one treatment, namely, that of a heavy application of a complete fertilizer before planting, gave significant increases in yield. Since unpublished data indicated some yield loss due to deep cultivation, it is suggested that this apparent increase due to fertilizer treatment may not have been a real increase but was due, rather, to the absence of root pruning occurring in the other plats where fertilizer was placed 10 in. below the surface. In certain plats where alfalfa was used in a 4-yr. crop rotation between removal of the old asparagus bed and resetting there was a significant increase in yield, not sufficient, however, to be considered a commercial success. Apparently a 4-yr. lapse of time was inadequate to insure commercial yields under the prevailing conditions.

The sterilization of lettuce seed, H. L. White (*Ann. Appl. Biol., 25 (1938), No. 4, pp. 767–780, pl. 1, figs. 7*).—Sterilization with calcium hypochlorite was found a safe and efficient method of treating lettuce seed, which is sensitive to copper sulfate, formalin, and organic mercury dusts. Treatment with calcium hypochlorite prior to sowing had an accelerating effect, independent of germicidal action, upon the germination of lettuce seed, especially that sown in contact with a film of agar. The vigor of the seed was concerned, seed of strong viability being more resistant to germicides than was older seed of less vigor.

Early Cheyenne pie pumpkin, L. Powers (*U. S. Dept. Agr. Cir. 537 (1939), pp. 4, fig. 1*).—Early Cheyenne pumpkin, resulting from inbreeding an early-maturing selection from commercial New England Pie, matures from 1 to 2 weeks earlier than the earliest strain of the parent variety. It is prolific and the fruits are small, being from 2 to 4 in. in length and from 5 to 7 in. in diameter. In flavor and other characteristics making quality, Early Cheyenne is fully the equal of commercial New England Pie, and is recommended for production in those sections where a small-fruited, early-maturing type of pie pumpkin is desired.

Results of tomato variety tests in the Great Plains region, M. F. Babb and J. E. Kraus. (Coop. Nebr. Expt. Sta.). (*U. S. Dept. Agr. Cir. 535 (1939), pp. 12, figs. 4*).—As a result of several years' trials, mainly at the Cheyenne Horticultural Field Station in Wyoming, during which approximately 400 varieties and strains were tested, there are presented descriptive and other notes on a number of well-known and little-known kinds. Because of the wide range in climatic conditions in the central Great Plains region, no variety was found to be equally suitable for all sections. One, designated as Johannisfeuer, and obtained from Germany in 1931, matured earlier than Earliana or any other medium-to-large-fruited variety tested. Undesirable because of the roughness of the fruits, this variety is believed of value to breeders as a source of early maturity. Danmark, obtained from Norway, ripened a few days prior to Earliana and bore round, smooth fruits of a rich red color, but was handicapped by small size.

The internal temperatures of fruit-tree buds, II, J. Grainger (*Ann. Appl. Biol., 26 (1939), No. 1, pp. 1–13, figs. 10*).—In this second paper (E. S. R., 76, p. 39), the author, again employing thermoelectric apparatus, found in records obtained during dormant-period frosts that bud temperature coincided fairly closely with air temperature during the most severe part of the frost. Temperatures of apple buds showed slight increases in relation to air temperatures during the early stages of a frost, particularly when the buds were breaking, but the rise was very slight and is deemed of little practical significance. Observations on apple buds during the operation of crude-oil-burning heaters indicated that

the benefits are due to the warming of the air by convection, rather than heating of the buds by direct radiation. The internal temperature of an apple bud was uniformly lower than that of the surrounding air during a frost occurring in the dormant period when the heaters were in action. Air temperatures around the bud were raised from 2° to 3° C. (3.6° to 5.4° F.) above that of the surrounding air. The results indicated that a heater providing moist, heavy smoke would be more effective than a flaming type.

Two apple flower buds on the same branch and separated by only 4 in. may have different internal temperatures, although a majority of records show considerable agreement. In the case of dormant raspberry buds, the internal temperatures were similar to those of apples. The buds were warmed more than the air by direct solar radiation and were usually cooler than air during the night, owing to evaporation. Flower buds, flowers, and developing raspberry fruits may attain a temperature of 40° C. during sunshine when the air is only 28°. Such high temperatures may aid in the ripening processes. Estimation of the freezing-point depression of standardized extracts from dormant and from bursting buds of hazel suggested that the sap cannot freeze more easily as the buds begin to open, their freezing-point depression actually being greater in this stage.

Some factors affecting the dropping of McIntosh apples, G. H. Dickson (*Sci. Agr., 19 (1939), No. 12, pp. 712–721, pl. 1, figs. 6*).—Observations on the fruit in two adjacent McIntosh plats, on one of which the cover crop was sown about May 15 and on the other about July 15, showed the percentage of drops to be greater on the late-planted area. Increased percentage of dropping was correlated with higher nitrate supply in the soil, larger total yields, and better growth on the trees on the area cultivated up to July 15. Color of fruit was much better in the area receiving the lesser cultivation. No correlation was established between individual trees and the fruit-dropping tendency, leading to the suggestion that the so-called nondropping sports of McIntosh may be the result of nutritional conditions rather than mutations.

The influence of various factors on the vitamin C content of German apple varieties [trans. title], W. Kessler (*Gartenbauwissenschaft, 13 (1939), No. 4, pp. 619–638, figs. 2*).—Assays by the chemical method of the ascorbic acid content of the important apple varieties showed well-defined differences that were sufficiently constant to be classed as varietal characteristics. Ascorbic acid content fluctuated within certain limits in many varieties because of such factors as light exposure, location, size of the crop, and fertilizers. Overmanuring with N tended to decrease the ascorbic acid content of the fruit, but whether this was a direct or an indirect effect was not established. In a given apple, the flesh on the more highly colored side had the higher ascorbic acid content. Storage temperatures below 5° C. (41° F.) were necessary for the retention of ascorbic acid over a considerable period. In general, apples of a given variety were higher in ascorbic acid when grown in southern than in northern locations. Of the many varieties tested, Ontario and Gelber Edel were the highest in ascorbic acid.

A study of the cause of "buttons" in the J. H. Hale peach, M. J. Dorsey (*Illinois Sta. Bul. 458 (1939), pp. 43, figs. 8*).—Stating that the tendency of the J. H. Hale peach to form undersized fruits, popularly known as buttons, is a serious defect in the variety, the author presents an analysis of the existing information on the subject and the results of histological studies of the flowers and developing fruits. Compared with normal peaches, buttons showed the following characteristics: Survival of all three drops, falling behind the normal fruits in rate of enlargement during the first growing period, smaller stones which hardened

a little later than normal, and ripening later than the normal fruits. In the peach, division in the endosperm nucleus occurs normally about 20 days after full bloom, and in the zygote a week or so later. In button fruits, development in the embryos and endosperm is either completely suppressed or, if occurring at all, is retarded greatly. Single fertilization, meaning gametic fusion with either the egg or fusion nucleus, is suggested as the most probable cause of button fruits. J. H. Hale and a few other peaches are inherently sensitive to adverse weather during the critical growth stages centering around pollination and fertilization. The retardation of growth processes, or the diminished pollen transfer during unfavorable weather, appear to be important factors in button production. Apparently initiation of the growth stimulus to the fruit as a whole, derived from fertilization, occurs at or soon after gametic fusion, and continues with or without the seed. The stimulus appears to be fractionated in single fertilization such as takes place in button formation. Restricted planting of varieties showing frequent button formation is advised.

Fall spray injury to peach trees, R. S. WILLISON (*Sci. Agr., 19 (1939), No. 11, pp. 670–672, pls. 2*).—The occurrence of twig injury in a commercial orchard which had been sprayed on November 25 with a 1:7 lime-sulfur was found to be almost invariably associated with the presence of spray residue on the surface of leaf scars. Microscopic examination of uninjured and injured leaf bases showed, in those bases with definite injury, evidence that the spray had penetrated and bleached the protective layer of dead tissue. Where injury was visible to the naked eye, the discoloration of cortical tissues and leaf traces immediately underlying the protective layer was apparent in the sections. It was indicated that when injury from fall applications of lime-sulfur does occur, the leaf scar is one of the main avenues of penetration.

Acid tolerance of the highbush blueberry, T. A. MERRILL (*Michigan Sta. Quart. Bul., 22 (1939), No. 2, pp. 112–116, figs. 2*).—Blueberry plants of the Rubel variety set in pails of soil collected from a portion of a field where there was a complete loss of plants within 5 yr. after planting responded markedly to applications of ground limestone sufficient to modify the pH from 3.2 to 3.9. At the same time, the control plats which received the same applications of N, P, and K made little or no growth and by the latter part of August were practically defoliated. Favorable results were also secured in the original field with applications of ground limestone in amounts sufficient to change the pH near the plants from 3.2 to 3.8. The omission of either Mg or Mn or both from the nutrient treatments had no noticeable effects on growth. Because of adequate N, P, and K in the soil, the omission of these elements from the treatments had no significant influence on plant growth. The symptoms associated with too great acidity were leaf scorch, beginning on the edge of the leaves, and finally the death of the plants.

The boysenberry in Michigan.—A preliminary report, R. E. LOREE (*Michigan Sta. Quart. Bul., 22 (1939), No. 2, pp. 109, 110*).—Briefly describing the habits of growth of the boysenberry, the author presents suggestions as to culture and management. The canes are said to be hardy if covered with snow but require covering with straw or soil in the colder sections of the State or where snowfall is light. Extensive plantings in Michigan are not advised.

Strawberry varieties in the United States, G. M. DARROW and G. F. WALDO (*U. S. Dept. Agr., Farmers' Bul. 1043, rev. (1939), pp. II+30, figs. 10*).—This is a revision of the earlier noted publication (E. S. R., 40, p. 838).

Parthenocarpy in the fig, I. J. CONDIT. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 401–404*).—The caprifig, the most primitive type of *Ficus carica*, shows parthenocarpic development in some varieties. In the edible

variety Croisic, parthenocarpy is complete in one crop and sometimes in the second crop. In Smyrna-type figs, parthenocarpy occurs to a limited extent in the first crop only in certain varieties. In the White San Pedro group, parthenocarpy occurs in the first crop and nonparthenocarpy in the second crop of the same tree in the same season. In common figs, there is complete parthenocarpic development in one or two crops of most varieties, but the completeness is dependent to a considerable extent on the environmental complex. Records on seedlings now in development are expected to yield data on the inheritance of the characteristic.

A study of developmental changes in composition of the macadamia, W. W. Jones. (Hawaii Expt. Sta.). (*Plant Physiol.*, *14* (*1939*), *No. 4*, *pp. 755–768*, *figs. 16*).—Studies of the physiological development of fruits collected at five intervals from flowering to maturity from five selected seedling trees showed two well-defined periods, the first from flowering to the end of 90 days, during which very little oil was formed and the embryo did not enlarge sufficiently for analysis and the second from the 90-day stage to maturity, embracing about 125 days, during which oil was formed and the major expansion of the embryo took place. The total-sugars content increased during the early oil formation but decreased as maturity was reached. Protein synthesis occurred during the same period as oil synthesis.

The development of the fruit of Macadamia ternifolia, M. E. Hartung and W. B. Storey. (Hawaii Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *59* (*1939*), *No. 6*, *pp. 397–406*, *pls. 3*, *figs. 5*).—Presenting the results of an investigation of the anatomy of the fruits and parts, the authors suggest that the fruit of *M. ternifolia* is a follicle and not a drupe. The pericarp is dehiscent along a single suture and is made up of a thick leathery exocarp and a thin soft endocarp. The so-called nut is a true seed having one seed coat that develops from the outer integument of the ovule, a hilum, and a micropyle. The shell of the nut is the testa, and the brown and white layers lining the inside of the shell are developed from the testa.

The manurial requirements of pyrethrum (Chrysanthemum cinerariaefolium Trev.), J. T. Martin, H. H. Mann, and F. Tattersfield (*Ann. Appl. Biol.*, *26* (*1939*), *No. 1*, *pp. 14–24*, *figs. 2*, *fig. 1*).—In trials on a sandy soil of low fertility, lime produced slight but not significant increases each year in the yield of flowers and their content of the pyrethrins and decreased the percentage of plant failures in the fourth and fifth years. There was a significant depression in yield of flowers in the year following an unusually heavy application of fertilizers. The annual application of moderate amounts of fertilizer gave significant increases in the yield of flowers in the second and fifth years and in the pyrethrin I content of the blooms in the fourth and fifth years.

Effect of synthetic growth substances on various types of cuttings of Arctostaphylos uva-ursi, J. A. DeFrance. (R. I. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, *35* (*1938*), *pp. 800–806*, *figs. 2*).—Cuttings of four types—multiple terminal, single terminal, single terminal with tip removed, and heel—collected on February 3, were planted in a bottom-heated propagation bench after treatment for 24 or 43 hr. in indolebutyric acid solution and in solutions of commercial materials. The rooting medium was one-third peat moss and two-thirds sand. In all cases the multiple terminal cuttings developed the greatest percentage of rooted plants. The superiority of the multiple cuttings is attributed to the greater content of natural auxins. In general, the least response to treatment was in the cuttings with excised tips. The removal of the tip apparently decreased the supply of natural auxin. The single terminals were, in some cases, superior to the heel cuttings in successful rooting.

The effect of temperature on splitting of carnations, A. J. SZENDEL (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 760–762*).—In a series of experiments extending over a 3-yr. period, it was established that the lower the temperature of the greenhouse the higher was the percentage of split calyxes. The number of petals per flower also increased as the temperature decreased. High temperatures (from 75° to 85° F.) for a period of 14 days or more greatly reduced the percentage of blooms with split calyxes, and buds formed during such periods did not split later. Plants grown at high temperatures and given an occasional low night temperature produced more splits than did those grown continuously at a low temperature. Splitting is attributed to a circumferential contraction of the calyx due to the lower temperature.

Three year studies in the behavior of twenty-one chrysanthemum clons flowering at different seasons, F. L. MULFORD. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 823–825*).—Studies in a systematically arranged planting providing five replicated plats of each variety indicated that there were two types of behavior with respect to blooming period. In one group, the varieties were very constant in their time of bloom over a 3-yr. period, and in the other there was wide variation from year to year between old plants and new cuttings. In general, the earlier-blooming clons showed the greatest variability in time of bloom. Since there is very little fluctuation in total daylight from year to year, it would appear that there were factors other than photoperiod which were concerned with the time of bloom.

Culture and diseases of delphiniums, F. L. MULFORD and F. WEISS (*U. S. Dept. Agr., Farmers' Bul. 1827 (1939), pp. II+12, figs. 4*).—General information is presented.

Life of gladiolus pollen prolonged by controlled conditions of storage, N. E. PFEIFFER (*Contrib. Boyce Thompson Inst., 10 (1939), No. 4, pp. 429–440, figs. 2*).—The most successful method of preserving viability of gladiolus pollen was storage in darkness at 10° C. (50° F.) in a humidity controlled by a saturated solution of potassium carbonate or sulfuric acid. Good results were also secured from storage over saturated solutions of magnesium chloride and calcium chloride at 10°. The pollen of most varieties showed greatly reduced vitality within 2 days when held at the usual room temperature and relative humidity. Seed produced by pollination with pollen stored for various intervals from 10 to 102 days gave a good stand of strong plants.

Comparative study of pollen of Lilium longiflorum varieties, T. B. POST. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 833–836*).—Abortive pollen was very high in Harrissi, with a mean of 44.82 ± 2.02 percent. The abortive grains were always of a peculiar elliptical shape, but there was no indication that defective pollen was associated with virus infection or with irregularities in meiosis. There apparently were two groups in the Creole variety, 7 of the plants averaging 22.14 ± 1.76 percent abortive grains and 12 plants 4.08 ± 0.43 percent. Again there was no evident correlation between abortion and virus infections. In the Erabu variety, 2 plants had 50 and 54 percent aborted grains. Excluding these varieties, the average for the other 16 was 6.81 ± 1.07 percent. Croft, with a number of different plant types, had a mean of 2.5 ± 0.82 percent of defective grains when one individual with 51 percent inferior pollen was omitted. In Giganteum, 12 normal plants averaged 4.08 ± 0.84 percent defective grains. Measurements of the diameter of pollen grains showed marked differences, but no evident relation existed between pollen diameter and percentage of abortion. Harrissi had the largest and Creole the smallest pollen. No relation was indicated between variability of pollen grains, size and percentage of viable pollen, self-fertility, or presence

of disease. The most variable pollen sample came from an apparently healthy self-fertile Erabu plant.

Development of dormancy in lily bulbs, N. C. Thornton (*Contrib. Boyce Thompson Inst., 10 (1939), No. 4, pp. 381–388, fig. 1*).—*Lilium longiflorum* bulbs of the Erabu variety, when stored in soil under conditions limiting aeration, developed partial dormancy, and when transferred to growing conditions produced either no growth or very slow-growing undersized plants, with the abnormally deep green foliage characteristic of dwarfed plants. Storage of bulbs in soil under conditions providing for aeration or O_2 supply resulted in rapid growth and satisfactory flower production. Bulbs harvested late and stored in soil in an open container renewed growth and produced flowers sooner than bulbs dug earlier and stored in a like manner for a longer period.

A statistical study of doubleness in nasturtium, S. L. Emsweller, C. O. Blodgett, and R. L. Pryor. (U. S. D. A. and Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), p. 826*).—The inheritance of doubleness in the nasturtium is complicated by some type of modification which controls the degree of expression of the recessive double gene. From a cross between a double and a single there were derived in subsequent inbred generations new intermediate, true-breeding forms. When continuous backcrosses were made to the recessive double, the mean petal number was increased as backcrossing was continued until it attained the value of the double parent. This sometimes occurred in the second backcross, but more often in the third. The authors suggest that this behavior indicates either modifying factors or that the double gene cannot fully express itself unless it is present in the double genotype.

Studies of the pollen of the perennial phlox, T. B. Post. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 831, 832*).—Observing that Miss Lingard, the only one of many varieties under study to show resistance to *Septoria* leaf spot, was highly sterile, the author tested the pollen of this and other varieties to determine possible causes of sterility. The percentage of bad grains was high in most of the varieties, ranging from 1 in Border Queen to 94 in Fiancee and Champs Elysees. The variety Miss Lingard had 36 percent abortive pollen. As to size of pollen, measured in microns and based on a 50-grain sample, Isabey had the smallest mean (42 ± 1.59) and Electra the largest (59.7 ± 2.06). Wide differences were observed in variability in size of pollen grains in the different varieties. The percentage of inferior pollen did not appear to be correlated with variability in size.

A study of flowering rose shoots with reference to flower-bud differentiation, A. Laurie and P. F. Bobula. (Ohio State Univ.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 767, 768*).—Observations upon the development of buds growing on the flowering shoots of the Better Times rose showed differentiation of the flower primordia as early as from 14 to 18 days after the buds had been made to assume a terminal position. Sepal primordia were noted in buds which had been in the terminal position for from 14 to 18 days, and both sepal and petal primordia were present after from 16 to 18 days.

Propagation of Sciadopitys verticillata with root-inducing substances, J. A. DeFrance. (R. I. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 807, 808, fig. 1*).—Cuttings from 4 to 5 in. long, taken January 29, were, after treatment with indolebutyric acid and a commercial growth-promoting substance, placed in an open greenhouse bench with bottom heat. The rooting medium was one-fourth peat moss and three-fourths sifted cinders. On April 18, when removed to a bed without bottom heat, roots 1 in. long were observed on some of the cuttings. A total of 70 percent of the indolebutyric acid-treated cuttings rooted, as compared with 0 for the water-treated controls.

Time of bloom of double and single stocks, R. L. PRYOR. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 765, 766, figs. 2*).—Observations on certain inbred lines of Column Lavender stocks grown at a temperature range of from 60° to 70° F. showed the double-flowered plants to bloom earlier than the singles.

Growth studies in tulips, R. L. PRYOR. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 763, 764, fig. 1*).—Measurements of bulbs dug at 2-week intervals from a planting of Pride of Haarlem tulips on October 16 showed two exhaustion periods during the growing period. The first occurred when the tops and flower stems began to elongate, the old bulb to disintegrate, and the new bulbs to form. The second low period occurred while the tops were elongating rapidly and during the maturing of the blooms. The main growth of the new bulb took place after flowering was completed.

Gravel and cinder culture of greenhouse flowering plants, A. LAURIE and A. WAGNER. (Ohio State Univ.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 769–772*).—Following a discussion of the structure of the beds, mediums, nutrient solutions, and general management, the authors present data on roses and chrysanthemums grown in soil and in nutrient solution cultures. In every case the gravel and cinder plats produced more roses per plant than did the soil, and furthermore the stems were longer in the cultures. Favorable results were also secured with the chrysanthemums in nutrient solutions.

Storage of some flower seeds, L. V. BARTON (*Contrib. Boyce Thompson Inst., 10 (1939), No. 4, pp. 399–427, figs. 7*).—Stating that low moisture content, combined with low temperature, represents a favorable storage environment for most species of seeds, the author reports that under good conditions seeds of original poor quality maintained their original viability as long as did seeds of higher quality. Plants grown from old seeds which had been stored under favorable conditions grew normally. Dandelion seeds could be stored safely at room temperature for 3 yr. if their moisture content was reduced to 5 percent or less and the containers were kept sealed. Sealed storage proved superior to open storage, regardless of moisture content, up to 7.9 percent when either room temperature or 5° C. (41° F.) was used. Similar behavior was recorded for aster and verbena seeds handled in the same manner. Sweet pea, pansy, and *Venidium* seeds kept viable for approximately 3 yr. under favorable storage. Regal lily seeds retained viability for at least 6 yr. under dry, cold conditions. Air-dry seeds of annual and perennial larkspur retained their original viability for 143 mo. of sealed storage at 8° and −15°, respectively. A temperature below 0° was necessary to keep seeds viable under high humidity conditions.

Effect of growth substances and maturity on rooting of cuttings of certain shrubs, L. E. LONGLEY. (Minn. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 827–830*).—In trials with a commercial form of indolebutyric acid it was found that in the case of leaf bud cuttings the growth substance had no apparent effect on certain shrubs, such as *Syringa japonica*, *Prunus padus*, *P. triloba plena*, and *Rubus deliciosus*, and a very definite influence in others, such as *P. tomentosa* and *Rhodotypos kerrioides*. With greenwood stem cuttings, the reactions were somewhat different, certain species showing a very marked response. Acceleration in rooting was notable in the case of *Sambucus racemosa laciniata* and others. Trials with layered cuttings of *Hedera helix* indicated that the tips are best for rooting and that old stems which have lost their leaves had little value. Using 1-, 2-, and 3-year-old wood of three species, the authors observed differential species response, indicating that it may be desirable, in some cases, to use older wood.

Vegetative propagation of conifers, I–III, N. H. Grace (*Canad. Jour. Res., 17 (1939), Nos. 6, Sect. C, pp. 178–180; 9, Sect. C, pp. 312–316; 11, Sect. C, pp. 376–379*).—Three papers are presented.

I. *Rooting of cuttings taken from the upper and lower regions of a Norway spruce tree.*—Observations on the rooting response of cuttings of comparable growth taken in mid-November from the upper and lower thirds of an 18-year-old Norway spruce tree showed a markedly higher success in rooting in those cuttings from the lower portion of the tree. The treatment of cuttings with talc containing 1,000 p. p. m. of indoleacetic acid increased the number of roots per cutting but decreased the mean length of roots. Lower cuttings produced twice the length of root of the upper cuttings, and the mean length of individual roots was also significantly greater. There was apparently some physiological difference between the wood of the upper and lower portions of the trees.

II. *Effect of nutrient solution and phytohormone dusts on the rooting of Norway spruce cuttings.*—Cuttings taken in January from branches from the upper portion of Norway spruce trees and planted in sand in a propagation frame responded favorably, as indicated in survival, to weekly applications of Hoagland's nutrient solution. Treatment of cuttings with 5, 100, and 1,000 p. p. m. of indoleacetic acid in talc failed to stimulate responses of cuttings—in fact, greater root length was attained with talc alone than with any of the chemical treatments. The 1,000 p. p. m. concentration reduced the mean root length significantly below talc alone and below no treatment. The reasons underlying the beneficial effects of talc alone are not understood.

III. *Effect of month of collection on the rooting of dormant Norway spruce cuttings.*—Two lots of Norway spruce cuttings, one from branches collected in November and buried under snow until early April, and the other collected from the trees in March, were, after treatment with talc alone and with talc containing indoleacetic acid in concentrations of 100 and 1,000 p. p. m., planted on April 5 in a propagation frame supplied with bottom heat. The number of cuttings rooted or callused was affected by the time of collection, but the indoleacetic acid-dust treatment had no significant effect on the number of cuttings rooted or callused. The treatments did not affect the number of cuttings that died. It was evident that branches stored under snow did not undergo physiological changes to the same extent as those left on the trees throughout the winter. Apparently, the rooting of dormant Norway spruce cuttings depended more on the time of collection than on the treatments given.

Municipal garden lawns and sport ground greens in Praha (Prague), V. Vukolov (*Pražské okrasné a hřištové trávníky. Praha: [State Insts. Agr. Res.], 1939, pp. 18, figs. 3; Eng. abs., pp. 17, 18*).—Observations on a large number of lawns in and near Praha showed a considerable portion to be defective because of weeds, poor nutrition, and inferior grass species. In the first-class lawns, species such as *Agrostis* spp. and *Poa trivialis*—plants with above-ground stolons—were predominant. Sometimes it was evident that insufficient care had been taken to mix thoroughly the different species of seed prior to planting. The three leading weeds were dandelion, plantain, and English daisy. Suggestions for the proper care of lawns are included.

FORESTRY

The management of farm woodlands, C. H. Guise (*New York and London: McGraw-Hill Book Co., 1939, pp. X+352, [pl. 1], figs. 57*).—Stating that most of the farm woodlands lie in eastern United States, this book presents information on the present condition of woodlands, structure and physiology of trees,

...umes of woodland products, growth and measurement of woodland timber, ...are and improvement of woodlands, planting, protection, utilization, marketing, ...te.

Windbreaks for Illinois farmsteads, J. E. Davis. (Coop. Univ. Ill.). *Ill. Nat. Hist. Survey Cir. 27 (1937), pp. III+17, pl. 1, figs. 12).*—General in...ormation is offered on the establishment, maintenance, and function of wind...reaks.

Soil-collecting trenches as substitutes for temporary check dams in re...foresting gullies, H. G. Meginnis. (U. S. D. A.). (*Jour. Forestry, 37 (1939), ...o. 10, pp. 764–769, figs. 4).*—Pointing out that the reforesting of gullies is a ...ficult and relatively expensive task, the author discusses the results obtained ...ar Holly Springs, Miss., with trenches excavated to a depth of about 18 in. ...d extending across the drainage channels where check dams would normally ...ve been placed. Within a few months, all the trenches had filled with soil ...wash. When 1-year-old nursery seedlings of black locust and loblolly pine ...ere planted, those of the latter species made excellent growth. The results ...dicate that with selection of suitable species the trench method may find con...derable use on erosion-control projects. Further studies are said to be needed ...fore final conclusions can be reached.

Botanical studies in the Black Rock Forest, H. M. Raup (*Black Rock Forest Bul. 7 (1938), pp. VI+161, pl. 1, figs. 20).*—This paper is presented in three parts, the first of which is a description of the forest area, its soil and climate, types of vegetation, tree associations, and the probable changes in tree composition since Colonial times. The second part is a catalog of the vascular plants; and the third part, by L. C. Raup, is a catalog of the lichens.

Physical properties of the cove soils on the Black Rock Forest, H. F. Scholz (*Black Rock Forest Bul. 2 (1931), pp. 59, pls. 2, fig. 1).*—Although repeated coppicing for a period of over 200 yr. has reduced the vitality of the growing stock and increased the percentage of less desirable species, there was no great or convincing evidence of destructive surface erosion. Mechanical analyses revealed only a slight tendency toward the physical translocation of clay and colloidal materials from the upper horizons to the lower, an indication of erosion in one of its most subtle forms. The humus content of the cove and slope soils was not abnormally low despite the existence of conditions which depleted the vitality of the growing stock. Brown soils were the predominant genetic soil type in the Black Rock Forest, but occasionally the effect of topography upon moisture and temperature and the character of the forest vegetation resulted in a definite leaching of these brown soils and in the formation of a slightly podsolized profile. The initial task appears to be the restoration of the growing stock by gradual conversion from coppice to seeding regeneration and the elimination of undesirable species. One of the questions requiring solution is that of the comparative value of different tree species for improving the soil.

Glacial geology of the Black Rock Forest, C. S. Denny (*Black Rock Forest Bul. 8 (1938), pp. III+73, pl. 1, figs. 22).*—Following a discussion of previous geological investigations in the region and a description of the topography of the Black Rock Forest, the author presents the results of a study conducted in the summer of 1937 in which a general survey was followed by observations in excavations located at critical points. That there had been no appreciable removal of material from the upland since the periglacial interval was indicated in the absence of alluvial fans in the valley bottoms. Two types of down-slope movement had occurred—the movement of the surface layer more or less as a unit, and the rolling and sliding of individual blocks. It appeared probable

that the area had been continuously under a forest or some other equally protective cover since periglacial time. The relationship between timber types and glacial deposits is discussed. No evidence was found to indicate that the repeated cutting and burning of the forest since Colonial times had accelerated geological processes such as erosion.

Ten year progress report, 1928–1938, H. H. TRYON (*Black Rock Forest Bul. 10 (1939), pp. IV+76, pl. 1, figs. 7*).—The Black Rock Forest, consisting of some 3,000 acres located partly in the town of Cornwall, N. Y., and partly in the town of Highlands, is discussed as to origin, objectives, program of investigation, experimental activities, and accomplishments during its first decade as a research and demonstration forest.

The nitrogen nutrition and growth of certain deciduous trees of northeastern United States, with a discussion of the principles and practice of leaf analysis as applied to forest trees, H. L. MITCHELL and R. F. CHANDLER, JR. (Coop. Cornell Univ.). (*Black Rock Forest Bul. 11 (1939), pp. VII+94, pl. 1, figs. 20*).—From sample plats established in stands of mixed hardwoods on each of six different sites and supplied with different amounts of nitrogenous fertilizers applied between April 20 and May 14, leaf samples were collected in early autumn from dominant and codominant trees. In addition, measurements were taken on the radial growth of marked trees by means of increment borings. Both radial growth and foliage N contents increased with increases in the amount of N supplied through a range of N supplies equivalent in effect to those of poor-to-good soils. On the fertilized plats the leaves of all species were from 30 to 150 percent larger and much darker green than those on the control non-N-supplied plats. The various species differed considerably in their response to N, yellow poplar, white ash, and basswood apparently being particularly "N requiring." A high degree of correlation was noted between tree growth and leaf N concentration. The possible use of leaf analysis as a means of evaluating soil N supply is discussed.

In a preliminary survey designed to supply information on the relative N availability of forest soils, leaf samples were secured and analyzed from 50 permanent and temporary sample plats located in 6 Northeastern States. The analyses indicated highly significant variations in N-supplying capacities. It appeared that 20 percent of the sites may be classed as N deficient, 65 percent as fair-to-good, and 15 percent as very good or better.

Hardware cloth seed-spot screens reduce high surface soil temperatures, H. A. FOWELLS and R. K. ARNOLD. (U. S. D. A.). (*Jour. Forestry, 37 (1939), No. 10, pp. 821, 822*).—Measurements taken at the Stanilaus branch of the California Forest and Range Experiment Station of the near-surface soil temperatures under a 4-mesh, 20-gage hardware cloth screen constructed in the form of a cone 10 in. high and 10 in. across the base showed an average maximum temperature inside the cone of 122.1° F., as compared with 134.3° outside. The difference was statistically highly significant.

The influence of some ground cover types upon tree seedling survival, M. W. DAY (*Michigan Sta. Quart. Bul., 22 (1939), No. 2, pp. 105–109, fig. 1*).—In the fall of 1936, forty 2-year-old seedlings of European larch, white pine, red pine, white spruce, and jack pine were planted on 10-by-10-ft. plats upon which the dominant ground covers were quackgrass, dewberry, and polytrichum moss, respectively. Before planting, the vegetation was clipped from each plat, but no further maintenance was given. The dewberry cover type in all cases showed much higher survival than the other two. Jack pine was the only tree to show fair survival on quackgrass and moss plats. The average growth rate of all species was best on the dewberry type. However, red pine and white

spruce made slightly better growth on the quackgrass soil, and the jack pine made its best growth on the moss type. Measurements indicated that site differences may be correlated with water table differences. The unfavorable moss site had a high water table in spring, often showing surface water.

European larch reproduces in eastern New York, D. B. Cook (*Jour. Forestry, 37 (1939), No. 11, pp. 891–893*).—Observations on a group of 74-year-old European larch trees located at Stephentown, N. Y., showed an abundant natural reproduction scattered over a considerable nearby area. A few trees were established as far as 3 miles distant. The naturalized trees were of good form and rapid growth, and in some cases were producing cones and fertile seed.

Soil characteristics, topography, and lesser vegetation in relation to site quality of second-growth oak stands in Connecticut, H. A. Lunt. (Conn. [New Haven] Expt. Sta.). (*Jour. Agr. Res.* [U. S.], *59 (1939), No. 6, pp. 407–428*).—Stating that approximately 56 percent of the area of Connecticut is in forest and brushland and that the predominant forest type is oak, the author presents the results of studies in 76 temporary plats in even-aged second-growth oak stands well distributed throughout the State. The five principal species were white, red, black, scarlet, and chestnut oaks, with a few swamp white and pin oaks. Site indexes were calculated from height curves and formulas supplied by the U. S. D. A. Forest Service. Nearly three-fourths of the plats had a site index between 50 and 70, and slightly over three-fourths were between the ages of 20 and 60 yr. Black oak averaged highest and chestnut oak lowest in site index.

When all plats were included, correlations between site index and characteristics of the surface soil were, for the most part, either entirely absent or slightly inverse. In some cases, high water table or seepage from higher ground was apparently of greater consequence than the soil itself in controlling tree growth. The omission of 11 plats that showed obvious external influences eliminated the inverse correlations and, at the same time, revealed a low but significant positive correlation between site index and total N.

Soil series groups showed no correlation with site index. With respect to humus types, plats having a mull condition averaged the highest site index, and the fibrous-mor-over-podzol type, the lowest. Topography came into the picture only as it influenced soil moisture and exposure to wind and sun. No reproduction of tree species was recorded on poorly drained soils. On sandy soils, gray birch, red maple, and oak were fairly abundant; and on compact subsoils, black cherry and sassafras were more abundant than most other species. Except for a few species, ground cover proved of little value in indicating site quality.

Reproduction of shortleaf pine following mechanical treatment of the seedbed, O. M. Wood. (U. S. D. A.). (*Jour. Forestry, 37 (1939), No. 10, pp. 813, 814*).—Observations on reproduction on plats established within an 80-year-old stand of shortleaf pine in the Lebanon Experimental Forest, N. J., indicated the value of breaking up the turf to expose the mineral soil. Of four treatments, (1) control, (2) removal of the surface litter by raking, (3) digging of the humus layer, and (4) removal of the turflike humus layer, the last gave by far the best results, measured in reproduction. Raking was of no benefit, while both digging and turf removal were significantly effective.

A study of several coniferous underplantings in the upper Hudson Highlands, H. H. Tryon (*Black Rock Forest Bul. 3 (1932), pp. [3]+27, figs. 13*).—Observations in several planted areas in the towns of Cornwall and Highlands, N. Y., and in the grounds of the United States Military Academy, for the most part on rough, stony land of no high degree of fertility, indicated

that height growth of coniferous underplantings is in direct inverse ratio to the amount of overhead shade coupled with the soil conditions and root competition thereby involved. Even after 15 yr. of suppression under a heavy hardwood overstory, Norway spruce displayed a vigorous response to release cuttings. Spruce gall louse damage was confined chiefly to trees under dense shade. The need of release cuttings for the coniferous species under observation was indicated beyond question.

The approach of loblolly and Virginia pine stands toward normal stocking, L. E. CHAIKEN. (U. S. D. A.). (*Jour. Forestry, 37 (1939), No. 11, pp. 866–871, figs. 6*).—A method is presented for estimating the rate of approach toward normality of abnormally stocked loblolly pine and Virginia pine stands. The main advantage of the method is that the change in density with age is estimated from observed average differences in densities of the present stands of different ages. Failure to take account of changes in rate of approach toward normality may lead to serious errors in growth predictions obtained through the use of yield tables.

Slash pine adaptation studies, H. F. MORRIS (*Texas Sta. Rpt. 1938, p. 196*).—An adaptation test on the Nacogdoches soils is briefly noted.

Southern pines pay: A story in pictures, W. R. MATTOON (*U. S. Dept. Agr., Misc. Pub. 357 (1939), pp. 28, figs. 39*).—Silvicultural management is discussed with the aid of appropriate photographs.

A high-duty woodsaw, H. H. TRYON (*Black Rock Forest Papers, 1 (1939), No. 15, pp. 99–102, figs. 6*).—Discussing some of the problems connected with the rapid and economical handling of cordwood, the author describes the construction and operation of a wood saw which gave satisfactory results.

A portable charcoal kiln, H. H. TRYON (*Black Rock Forest Bul. 4 (1933), pp. [4]+34, figs. 17*).—The design, construction, and operation of a portable-type steel kiln for charcoal manufacture are described.

Forest products statistics of the Lakes States, R. V. REYNOLDS and A. H. PIERSON (*U. S. Dept. Agr., Statis. Bul. 68 (1939), pp. 40, figs. 2*).—Following the procedure in earlier publications (E. S. R., 81, p. 47), data are presented in tabular form on lumber production, distribution, consumption, and prices in Michigan, Minnesota, and Wisconsin over a period of years.

DISEASES OF PLANTS

Abtracts of papers presented at the thirty-first annual meeting of The American Phytopathological Society, Columbus, Ohio, December 27 to 30, 1939, inclusive (*Phytopathology, 30 (1940), No. 1, pp. 1–29*).—The following are included: A New Strain of the Tomato Leaf Mold Fungus *Cladosporium fulvum*, by L. J. Alexander; Bacterial Stalk Rot of Field Corn Caused by *Phytomonas lapsa* n. sp., and Relation of Reducing Substances to Longevity and Virulence of Phytopathogenic Bacteria, both by P. A. Ark; *Fusarium* wilt of Cotton and Tobacco Apparently Caused by the Same Organism, by G. M. Armstrong (S. C. Expt. Sta. and U. S. D. A.); Studies of *Olpidium trifolii* and *Urophlyctis trifolii* on White Clover in Louisiana, by R. E. Atkinson; Pathogenicity and Hosts of the Fly-Speck Fungus [*Microthyriella rubi*] of Apple, by R. C. Baines; Acquisition and Transmission of Viruses by Dodder (*Cuscuta subinclusa*), by C. W. Bennet; Mechanical Transmission of Aster-Yellows Virus to Leaf Hoppers, by L. M. Black; Cytological Studies of Sporidial Fusion in *Ustilago zeae*, by D. H. Bowman; The Boron Deficiency Disease of Apple, by A. B. Burrell and F. H. Lewis; Sulphur as a Protectant of Cereal Crops, by K. D. Butler; Cross Inoculations With Loose Smut of Wheat, by R. M. Caldwell

and L. E. Compton (Ind. Sta. and U. S. D. A.); The Effect of a Diseased Cotton Seed on an Adjacent Healthy Seed, by K. S. Chester and G. Tennyson; Disease Resistance in the Genus *Nicotiana*, by E. E. Clayton and H. H. Foster; Sweet-Potato-Storage House Fumigation, by H. T. Cook and T. J. Nugent; Preliminary Serological Studies of *Phymatotrichum omnivorum*, by R. W. Cumley and G. W. Goldsmith; Organic Seed Protectants for Lima Beans, by H. S. Cunningham and E. G. Sharvelle; A Method for Testing the Pathogenicity of *Actinomyces* Isolates, by P. Decker; The Relation of Stomata to Wildfire Infection, by S. Dischun; Inoculation Experiments and Reaction of Inbred Lines of Corn to *Ustilago zeae*, by J. G. Dickson and D. H. Bowman (Wis. Sta. and U. S. D. A.); Modifications in Cells of Plants Affected by Virus, by J. Dufrenoy; Reactions of Cells of Sugarcane Stalks to the Red Rot Fungus, *Colletotrichum falcatum* Went, by J. Dufrenoy and C. W. Edgerton; The Influence of Ultraviolet Irradiation on the Pathogenicity of *Phytomonas tumefaciens*, by B. M. Duggar and A. J. Riker; Root Girdle [of beets, carrots, lettuce, and spinach] Caused by High Wind, by E. L. Felix; Variation in *Dothiorella ulmi*, the Elm *Cephalosporium*, by L. M. Fenner; The Thixotropic Character of the Tobacco-Mosaic-Virus Protein, by V. L. Frampton; Some Factors That Affect the Spray Program in the Control of Cedar Apple Rust Fungi on the Apple, and Methods for Determining the Effectiveness of Fungicides Against Apple Scab and the Cedar-Apple Rust Fungi, both by J. M. Hamilton and L. O. Weaver; The Dissemination of Yellow Dwarf of Potatoes and Its Leaf Hopper Vector, *Aceratagallia sanguinolenta*, by E. D. Hansing and V. L. Frampton; Insects in Relation to Root Rot and Basal Stem Rot of Cereals, by E. W. Hanson and J. J. Christensen, and Effect of Fertilizers on the Development of Bunt of Wheat, by E. W. Hanson and I. W. Tervet (both U. S. D. A. and Minn. Sta.); A Fungous Parasite of the Pine Bark Beetle, by J. G. Harrar and J. G. Martland; A Wilt of Tree *Paeonia* (*Paeonia moutan*), by M. R. Harris; Transformation of Haustoria and Hyphal Tips of *Puccinia graminis tritici* Into Spore-like Bodies, by H. Hart and J. L. Allison; Effect of Soil Reaction on Soil Rot of Sweet Potatoes, by J. D. Hartman and R. W. Samson; Association of *Bacterium phaseoli* and the Virus of Common Bean Mosaic, by F. Hedges; Spraying Tomatoes for Disease Control, by R. G. Henderson and S. A. Wingard; Maintaining Quality of Tomatoes by Delayed Spraying, by J. W. Heuberger and J. G. Horsfall; Strains of the Fire-Blight Organism, by E. M. Hildebrand; Yellow-Red or "X" Disease—A New Threat to Peach Industry, by E. M. Hildebrand and D. H. Palmiter; The Response to Certain Vitamins of Fourteen Species or Strains of the Myriangiales, by A. B. Hillegas, F. Kavanaugh, and A. E. Jenkins; Succession of Soil-Inhabiting Fungi Attacking the Roots of Maize, by W.-C. Ho and I. E. Melhus; A Comparison of Pathogenic Races of *Fusarium bilbigenum* var. *niveum*, by D. E. Hoffmaster; Relation of Color to Fungicidal Value of Insoluble Copper Compounds, by J. G. Horsfall and J. W. Heuberger; Bleeding Canker of Maple, by F. L. Howard and N. Caroselli; Peach-Mosaic Virus Strain Studies, by L. M. Hutchins and L. C. Cochran; A Bulb Disease of Lilies Caused by *Fusarium* spp., by E. P. Imle; *Elsinoë* and *Sphaceloma* Species in the United States, Puerto Rico, and Guam, by A. E. Jenkins and A. A. Bitancourt; Bacterial Leaf Diseases in Tobacco Beds in Relation to Field Infection, by E. M. Johnson and W. D. Valleau; A Buff Smut of Fall *Panicum*, by H. W. Johnson, H. A. Rodenhiser, and C. L. Lefebvre; Inoculation of Bean With Extracts From Other Healthy Legume Species, by J. Johnson; A Rare Virus Disease on Tobacco, by J. Johnson and R. W. Fulton; A Bud-Transmissible Chlorosis of *Prunus cerasus*, by G. W. Keitt and C. N. Clayton; Eradicant Fungicidal Treatments in Relation to Apple-Scab Control, by G. W. Keitt, C. N. Clayton, and M. H. Langford;

Variation in the Germination of Chlamydospores of *Ustilago zeae*, by M. F. Kernkamp and M. A. Petty; Physiologic Race Determination in *Puccinia coronata avenae*, by C. H. Kingsolver and H. C. Murphy; Studies on *Phytophthora citrophthora*, by L. J. Klotz; Rapid Seed-Corn Drying Checks Seed Infection, by B. Koehler; Seed Treatment for the Control of Bacterial Bean Blight, by K. W. Kreitlow; A Necrotic Virosis of Cabbage, by R. H. Larson and J. C. Walker (Univ. Wis. and U. S. D. A.); A New *Phoma* Disease of Perennial Delphinium, by T. Laskaris; Fungi Associated With *Scolytus multistriatus* in Regions Where *Ceratostomella ulmi* Has Not Been Found, by J. G. Leach; The Reniform Nematode as a Root Parasite, by M. B. Linford, J. M. Oliveira, and F. Yap; Hyperauxony of Nodules of Red Kidney Bean, Soybean, and Garden Pea, by G. K. K. Link and V. Eggers; Dissemination of the New York Aster-Yellows Virus and Its Leaf-Hopper Vector, *Macrosteles divisus* in Endive Beds, by M. B. Linn; The Epidemiology and Control of Hop Downy Mildew, by R. O. Magie; A Comparison of Methods of Laboratory Spraying for the Testing of Protective Fungicides, by S. E. A. McCallan and F. Wilcoxon; Field Studies on Paradichlorobenzene in the Control of Tobacco Downy Mildew, by R. McLean and J. A. Pinckard; Adaptive Parasitism of *Phytophthora infestans*, by W. R. Mills; Auxin Production by *Ustilago zeae* Grown on a Medium Free of Tryptophane, by J. E. Moulton and G. K. K. Link; Effect of the 1938 Crown-Rust Epiphytotic on Yield, Bushel Weight, and Lodging of Oats in Iowa, by H. C. Murphy, L. C. Burnett, and C. H. Kingsolver (U. S. D. A. and Iowa Sta.); Progress in Onion-Smut Control by Seed Treatment, by A. G. Newhall; Onion Bloat or Eelworm Rot Caused by the Nematode *Ditylenchus dipsaci*, by A. G. Newhall and B. G. Chitwood; Studies on the Fungicidal Properties of Silver, by L. W. Nielsen; The Character of Supplements and Their Effect on the Performance of Copper Fungicides, by A. A. Nikitin; Eradicant Treatments as an Aid in the Control of Apple Scab, by D. H. Palmiter; The Soil Rot, "Pox or Pit," of Sweet Potato, by L. H. Person; A Laboratory Method for Determining the Fungicidal Value of Vapors and Its Application to Paradichlorobenzene in the Control of Tobacco Downy Mildew, by J. A. Pinckard and R. McLean; *Phytophthora* Disease of Maples, by P. P. Pirone; Brown Scale Disease of Easter Lily, by A. G. Plakidas; Effect of Some Mineral Nutrients on Development of Clubroot (*Plasmodiophora brassicae*), by D. E. Pryor; Control of Seed- and Soil-Borne Diseases of the Potato, by C. S. Reddy and G. N. Davis; White Pine Selected in Blister-Rust Areas, by A. J. Riker and T. F. Kouba; Studies on Environmental Factors Affecting Infection and the Development of Bunt in Wheat, by H. A. Rodenhiser and J. W. Taylor; Properties and Purification of Alfalfa-Mosaic Virus, by A. F. Ross and W. M. Stanley; Physiological Specialization in *Cercospora oryzae*, by T. C. Ryker; Seed Transmission of Tomato Mosaic, by R. W. Samson; Cultural Variation and Physiologic Specialization of *Actinomyces scabies*, by L. A. Schaal (U. S. D. A. and Minn. Sta.); Growth Stimulation of *Diplodia zeae* and Seedling Infection of Maize by *Diplodia zeae* in Steamed and Nonsteamed Soil, both by G. Semeniuk; The Prevalence and Destructiveness of Plant Diseases in Iowa From 1850 to 1937, by D. R. Shepherd; Effect of Nitrogen Nutrition on Virus Multiplication in Tobacco, by E. L. Spencer; Population Trends of Physiologic Races of *Puccinia graminis tritici* in the United States from 1930 to 1939, by E. C. Stakman, R. C. Cassell, and W. Q. Loegering (U. S. D. A. and Minn. Sta.); Potato Ring-Rot spread and Its Control by Disinfectants, and Treating Deciduous Trees for Chlorosis, both by G. H. Starr; Phloem Necrosis in the Ohio River Valley, by R. U. Swingle; Preemergence and Postemergence Factors That Influence the Infection of Barley by Covered Smut and Nigra

Loose Smut, by V. F. Tapke; Control of Leaf Spot on Sour Cherries in West Virginia, by C. F. Taylor; Problems in the Determination of Physiologic Races of *Ustilago avenae* and *U. levis*, by I. W. Tervet; Permeability Change as a Significant Factor in Parasitism, by F. S. Thatcher; Additional Facts Regarding Bacteriophage, by R. C. Thomas; Inheritance of Resistance to *Erysiphe graminis hordei* in a Cross Between Featherstone and Nepal Barley, by J. S. Tidd; *Verticillium* Wilt of Chrysanthemums, by P. E. Tilford and H. A. Runnels; Control of Leaf Blights of Fig, by E. C. Tims; Observations on a Noteworthy *Helminthosporium* Disease of Corn, by A. J. Ullstrup (U. S. D. A. and Ind. Sta); Virus Distribution in Mosaic-Susceptible and Mosaic-Resistant Burley Tobacco, by W. D. Valleau and S. Diachun; Classification and Nomenclature of Some Phytopathogenic Species of *Bacillus*, by E. L. Waldee, G. C. Kent, and I. E. Melhus; Histological Studies of Storage Scab Lesions on Mature Apple Fruits, by E. A. Walker; A Method of Reducing Clubroot Infection at Transplanting, by J. C. Walker, M. A. Stahmann, and D. E. Pryor (Univ. Wis. and U. S. D. A); Evidence of Passive Immunization of Plants From Curly Top, by J. M. Wallace; New Facts Concerning the Plane Disease, by J. M. Walter and P. V. Mook; *Pythium* Injury of Oats, by A. Welch; Eradicant Sprays for the Control of Blossom Infection by *Sclerotinia laxa*, and Comparisons of *Phytomonas cerasi* with *Phytomonas syringae*, both by E. E. Wilson; Comparative Values of the Fixed Coppers as Vegetable Sprays, by J. D. Wilson and H. C. Young; The Comparative Effect of Various Sulphur and Copper Sprays on Quality, Color, and Size of Sour Cherries, by H. F. Winter and H. C. Young; The Diurnal Cycle of *Taphrina deformans*, and Sporulation Injury Associated With Downy-Mildew Infections, both by C. E. Yarwood; Relative Susceptibility of Young Pine Trees in Artificial and Natural Stands to Invasion by Fungi and Bacteria, by H. H. York; and Resistance of Tomato Varieties to Blossom-End Rot, by P. A. Young.

The Plant Disease Reporter, [December 1 and 15, 1939] (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 23 (1939), Nos. 22, pp. 351–372, figs. 5; 23, pp. 373–390, figs. 3*).—The following are included:

No. 22.—A key to the typical viruses of leguminous crops, by F. Weiss; the relation of the climatology of western Oregon to the incidence and control of downy mildew of hops, by G. R. Hoerner; observations of flax diseases in 1939, by A. C. Dillman; *Phaeocryptopus gäumanni* in Douglas fir in Connecticut, by F. A. McCormick; discovery of tobacco black shank (*Phytophthora nicotianae*) in Virginia, by S. A. Wingard; brief notes on some diseases newly reported from various localities, including bacterial ring rot of potato from Iowa, take-all of wheat from Delaware, and *Ganoderma* causing root rot of *Colutea* in Oklahoma; and X-disease (peach and chokecherry) clinic, by E. M. Hildebrand.

No. 23.—Diseases of fruits and vegetables on the New York market during the months of April to September, inclusive, 1939, by J. S. Wiant and C. O. Bratley; some notes on bacterial ring rot (*Phytomonas sepedonica*) of potatoes in California, by G. L. Stout; bacterial ring rot of potato in Idaho, by C. W. Hungerford and J. M. Raeder; vegetable seed treatment tests in New York, by H. S. Cunningham; downy mildew injury of tobacco in the field and after harvest in Massachusetts, by O. C. Boyd; tobacco field diseases in Florida, 1939, by R. R. Kincaid and W. B. Tisdale; smut losses drop in the Northwest; observations on several diseases of hardwoods in the Lake States, including *Eutypella* canker on box elder, *Schizoxylon* canker on elm, and heart rot of black ash, by R. C. Lorenz and R. W. Davidson; *Fomes annosus* on conifers in Connecticut, by E. M. Stoddard, A. D. McDonnell, and H. W. Hicock; notes on "X-disease" of peach—control in Connecticut and report from Wisconsin, by

E. M. Stoddard; *Sclerotium rolfsii* on apple trees, by J. S. Cooley; and apple diseases in Pennsylvania—summary of apple diseases in all parts of the State during 1939, by R. S. Kirby, G. L. Zundel, A. H. Bauer, and H. W. Rankin.

Plant-disease investigations (*Puerto Rico Sta. Rpt. 1938, pp. 121–129, figs. 2*).—Brief progress reports are included on papaya (*Carica papaya*) bunchy top, including disease manifestations under different soil conditions and testing of possible vectors, a new species of leafhopper (*Empoasca papayae* Oman) stunting papaya plants, and entomogenous fungi parasitizing papaya insects; vanilla diseases, including wilt or root rot and dieback; sulfur quantity test, and manganese sulfate and sulfur test in relation to sugarcane chlorosis.

[**Plant disease work by the Texas Station**]. (Partly coop. U. S. D. A.). (*Texas Sta. Rpt. 1938, pp. 16, 17, 63, 64, 72–81, 132–134, 149–151, 153–155, 160, 161, 164, 165, 167, 168, 193, 194, 196–200, 234–240, 244, 253, 259–261, 262*).—Reports of progress by various staff members of the station (including G. E. Altstatt, L. M. Blank, L. E. Brooks, A. L. Burkett, A. A. Dunlap, W. N. Ezekiel, J. F. Fudge, G. H. Godfrey, G. A. Greathouse, A. L. Harrison, S. S. Ivanoff, S. E. Jones, D. T. Killough, E. W. Lyle, P. F. Macy, P. C. Mangelsdorf, A. L. Martin, E. S. McFadden, H. F. Morris, T. B. Randolph, N. E. Rigler, J. E. Roberts, C. H. Rogers, H. P. Smith, G. M. Watkins, and P. A. Young) are presented on the relation of organic substances, trace elements, and calcium cyanamide to the Texas root rot fungus; breeding wheat and oats for rust resistance; conditions affecting the local prevalence of root rot on cotton, studies of the life history of the causal fungus (*Phymatotrichum omnivorum*), the cause of immunity of monocotyledons to it, girdling of cotton plants as affecting survival of the fungus, field studies on resistance in cotton, nutrition of the fungus and the effects of certain metallic ions on its growth, chemical studies on the nature of resistance of certain plants to this root rot, and the distribution of berberine in roots of *Mahonia* spp. and its relation to root rot resistance; cottonseed treatments for fungus and bacterial diseases; regional cotton wilt variety studies; tomato diseases, including control of bacterial spot and early blight, damping-off control, and the use of roll poles as plant-bed covers to prevent tomato diseases; effects of various fungicides on black spot and histological and culture work on *Gloeosporium* black canker of roses; the effect of sulfur dusts on the occurrence of leaf rust of wheat; lodging of sorghum in relation to fungus infection; diseases of vegetable crops, including selection and treatment of garlic bulbs with special reference to diseases, chemical treatments of seed and soil for damping-off control, and laboratory tests of fungicides on the germination of spores of various fungi; work at Tyler Substation on rose diseases, including black spot, dieback, crown gall, and root knot diseases; at Beaumont Substation on rice diseases, including the distribution of black kernel disease, fungi recovered from discolored rice kernels, inoculation of rice plants with fungi and discolored kernels, post-harvesting tests and their effect on the black kernel disease, and the influence of various fertilizers on the number of black kernels and yield of rice; at Temple Substation on cotton root rot investigations (including the effect of continuous cotton, corn, sorghum, and oats on the number and viability of sclerotia, the number and viability of sclerotia from a native meadow, root rot in cotton planted for the second successive year on a native meadow, effect of oil and cotton bur ashes on cotton root rot control, quality of cottonseed from plants killed at different dates by cotton root rot, selections of cotton plants for resistance to root rot, and comparative resistance of Brabham, Iron, and Blackeye cowpeas to root rot), test of disease-resistant Darso, small grain rust resistance test, cotton root rot in rotations, and miscellaneous diseases of plants; at Denton Substation on leaf and stem rusts, and loose smut of wheat; at Nacogdoches

Substation on regional cotton wilt variety studies, chemical control of root knot (*Heterodera marioni*), *Fusarium lycopersici*, damping-off organisms, and southern blight (*Sclerotium rolfsii*, etc.), control of damping-off in seed beds, and tomato diseases (including field tests for resistance to wilt, longevity and transmission studies of wilt, blossom-end rot as a physiological abnormality, seed transmission of bacterial spot, southern blight, effect of sprays on tomato plants and foliage diseases, a white-flowered selection resistant to wilt, and the red pepper tomato and its resistance to wilt); at Weslaco Substation on citrus gummosis and wood rot, protection of young trees against infection, sour orange resistant to gummosis, inoculations of the gummosis fungus, lemon stem-end rot and its control, citrus chlorosis, the development of a sulfur-organic acid compost and its use in chlorosis control, potato diseases (including late blight, copper spray and dust coverage and adhesiveness, early blight, and notes on spraying equipment), cabbage black rot and seed treatments for its control, tomato bacterial soft rot, bean root rot due to the meadow nematode (*Pratylenchus pratensis*), cornstalk rot, cotton root rot, soil sterilization by chloropicrin fumigation, and control of eggplant yellows; at Iowa Park Substation on root rot studies (including crude oil treatment on cotton land, and grape resistance studies); and at Winter Haven Substation on white rust and curly top of spinach, onion pink root, onion "blight" (believed to be nonparasitic), tomato fruit "pox" (cause unknown), and eggplant yellows (nature and transmission unknown).

Developments in germicidal lamps, L. C. PORTER (*Agr. Engin., 20 (1939), No. 11, pp. 437, 438*).—A compilation of data believed of value in solving problems involving the use of sterilizing lamps.

A metering pump for small volumes of solution, M. A. RAINES (*Plant Physiol., 14 (1939), No. 4, pp. 829–831, fig. 1*).—The bucket type of pump described for delivering small measured volumes of solution has only one moving part and no small orifices. A glass wick may be used for draining the solution from the open end of the outflow tube. In its path through the apparatus the solution need not contact any material other than glass.

The effects of oil sprays on plant tissues, E. T. BARTHOLOMEW. (Calif. Citrus Expt. Sta.). (*3. West. Shade Tree Conf., Palo Alto, Calif., 1936, Proc. Ann. Mtg., pp. 53–61*).—A critical review, with four pages of references.

Pathological changes in protoplasm, W. SEIFRIZ (*Protoplasma, 32 (1939), No. 4, pp. 538–550, figs. 15*).—This enumeration of pathological changes is based primarily on observations of the plasmodium of the myxomycete *Physarum polycephalum*, but *Amoeba*, *Euplotes*, eggs of algae and echinoderms, red blood cells, and protoplasts of *Elodea*, *Allium*, and other higher plants are also included. The phenomena discussed are included under color changes, coagulation, viscosity changes, brownian movement, dissolution, fragmentation, structural collapse, internal readjustment, permeability changes, surface changes, exudations, volume changes, irritability, streaming, amoeboid movement, and changes in growth rate and type and in form. It is hoped that this list of changes will serve as a beginning toward standardizing the many abnormal changes which protoplasm may undergo.

A review of the Armillaria root rot problem, HAROLD E. THOMAS. (Univ. Calif.). (*3. West. Shade Tree Conf., Palo Alto, Calif., 1936, Proc. Ann. Mtg., pp 86–90*).

The earlier phases of the bacterial culture cycle, C.-E. A. WINSLOW and H. H. WALKER. (Univ. Tenn. et al.). (*Bact. Rev., 3 (1939), No. 2, pp. 147–186*).—This comprehensive review (about six pages of references) considers the bacterial culture cycle and its significance, the phase of adjustment, the phase of

physiological youth (metabolic activity, morphologic changes, lowered resistance to unfavorable agents, and acid agglutination and electrophoretic mobility), and the phase of logarithmic increase and the completion of the normal culture cycle. The changes in a culture during the phases of accelerated and logarithmic death correspond to the senile changes in the multicellular organism after the normal reproductive period is passed. They represent phenomena of a somewhat distinct type from those apparent in the early phases considered in the present review.

The growth of Dictyostelium discoideum upon pathogenic bacteria, K. B. Raper and N. R. Smith. (U. S. D. A. et al.). (*Jour. Bact., 38 (1939), No. 4, pp. 431–442, pls. 2, fig. 1*).—This nonplasmodium-forming slime mold was grown in pure-mixed culture on hay-infusion agar with 22 species and strains of bacteria pathogenic to plants, animals, or man, and its growth with these organisms was quantitatively measured. In most cases the colonies of associated bacteria were completely consumed by the myxamoebae. Tests with three bacterial species were made using media other than hay-infusion agar. Other slime molds of this group, widely distributed in nature, are said to be also capable of feeding on a variety of pathogenic bacteria. On account of the ease with which they can be identified and maintained in culture, species of the Dictyosteliaceae afford excellent material for studies relating to the nutrition and feeding of amoeboid cells.

Host range studies with Bacterium solanacearum, T. E. Smith. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 59 (1939), No. 6, pp. 429–440, figs. 5*).—The susceptibility of 90 plant species was established by stem inoculation of wedges of woody tissue from spontaneously infected tobacco and by infection when grown on naturally infested soil under very severe disease conditions, 29 species proving susceptible (3 more so than tobacco) and 56 immune under both test methods. Five species were susceptible to stem inoculation but were apparently immune to soil-borne infection from naturally infested soil, and following stem inoculation of these plants the bacterial population was vastly smaller than in infected tobacco. Such species are therefore not considered true host plants. Removal of the following from the host list is recommended: Sweetpotato, cotton, watermelon, fireweed (*Erechtites hieracifolia*), *Crotalaria striata*, velvetbean, lima bean, soybean, and cowpea. Five species of native weeds were reported susceptible for the first time, viz, *Xanthium pennsylvanicum*, *X. chinense*, *Physalis pruinosa*, *Aster pilosus*, and *Ambrosia trifida*.

The effect of host nutrition on concentration of tobacco-mosaic virus, E. L. Spencer (*Plant Physiol., 14 (1939), No. 4, pp. 769–782, fig. 1*).—Turkish tobacco plants grown in nutrient solutions containing a low, medium, or high nitrogen level were inoculated with tobacco-mosaic virus. When the virus activity in juice from such frozen plants (harvested at three intervals after inoculation) was measured, a direct correlation with the amount of N supplied was noted, the virus concentration of juice from the high N plants being over 80 times that from the low N group. Moreover, the virus content of juice from plants in sand receiving the medium N solution was more than double that in juice from plants grown in composted soil. It is deemed not improbable that the low virus activity here was brought about by limitation in N supply. With insufficient N the total virus content in extracted juice decreased following the initial spread of the virus through the plant, while with an overabundance of N the virus content increased at a faster rate than that at which the plants grew. The virus increase showed no apparent correlation with plant growth. The total and protein N contents of expressed juice varied directly with the N level of the nutrient solution, and these amounts were much larger in juice from dis-

eased than from corresponding healthy plants. Virus activity was directly correlated with the N content of juice from diseased plants. Juice with the highest total and protein N contents was found to have the highest virus activity.

New and unusual species of Uredinales, E. B. Mains (*Bul. Torrey Bot. Club, 66 (1939), No. 9, pp. 617–621*).—Data are presented concerning a number of species of rusts based on information obtained from collections received from various sources, new taxonomy being noted in the genera *Puccinia*, *Frommea*, *Pucciniastrum*, and *Uredo*.

Two new species of rust, W. H. Long and L. N. Goodding (*Mycologia, 31 (1939), No. 6, pp. 670–673, fig. 1*).—*Ravenelia dysocarpae* on *Mimosa dysocarpa*, and *Gymnosporangium vauqueliniae* on *Vauquelinia californica* and *Juniperus monosperma*, are described and illustrated as new.

Investigations on certain toxic substances obtained from the wheat plant which inhibit the germination of the uredospores of various wheat rusts, A. F. Parker-Rhodes (*Jour. Agr. Sci.* [*England*], *29 (1939), No. 3, pp. 399–417, figs. 6*).—A method of preparing the toxic solutions from wheat leaves and precautions minimizing unknown variable factors affecting their activity are described. The urediospores used germinated better in extracts from Little Joss wheat infected with *Tilletia tritici* than in that from healthy plants, this being correlated with the relative susceptibility of the two kinds of plant under field condiitons, but no correlation was obtained among the four wheat varieties tested in the healthy state. By a second method described, solutions were obtained in which enzyme activity during preparation was reduced to a minimum. It was found that solutions so prepared were nontoxic, if obtained from healthy living leaves, though present in decaying leaves. It is thus deduced that the toxic substances discussed are formed in the course of autolysis. Using the second method of preparation, solutions from rusted leaves were toxic. In a test designed to show the effects of different nutritional treatments, excess potassium and deficiencies in minor elements were conducive to production of toxins. By experiments described it is shown that the toxins produced by infection with *Puccinia glumarum tritici* are toxic only to spores of that species but not to those of *P. triticina*, and vice versa. This last result is commented upon, and evidence is adduced to suggest that the toxic substances first described are of the nature of proteins of light molecular weight. From the fact that they were nonspecific it appears clear that they are not of the same nature as the specific toxins produced in response to rust attack. It is suggested that the latter are analogous to the antibodies of animal pathology, but two alternate hypotheses are also introduced.

Diseases of small grain crops in Illinois, G. H. Boewe (*Ill. Nat. Hist. Survey Cir. 35 (1939), pp. [5]+130, pl. 1, figs. 47*).—This publication is divided into six chapters: Nature of cereal diseases, wheat diseases, oats diseases, barley diseases, rye diseases, and cereal disease control. All the important diseases found on small grains in Illinois are illustrated from photographs and described in detail, and under each is given the life history of the causal organism, its importance in the State, and suitable control measures. A key to diseases based on host symptoms is inserted at the beginning of each host section, and a figure showing comparable stages in the life histories of the wheat plant and of four important fungus parasites of cereals is included. Control measures are discussed under the headings of good farm practices, regulation, and seed treatment.

"Leaf spot" disease attacks Blue Rose and Early Prolific rices, L. C. Carter. (Ark. Expt. Sta.). (*Rice News, 6 (1939), No. 11, p. 10*).—A note on varietal resistance tests of rice varieties against the *Cercospora* and *Helmintho-*

sporium leaf spots, and a reference to "white tip" or dying of rice leaves for an inch or more on the end, believed to be as serious as the leaf spots. Progress in a comprehensive rice breeding program is also reported.

Effect of fumigation of wheat on amylase content, V. D. Martin (*Iowa State Col. Jour. Sci., 12 (1938), No. 4, pp. 467–470*).—When the wheat grain was treated with the frequently recommended amounts of 15 different fumigants the amylase was not injured, nor was it injured by increasing the amounts by five times. That the absence of harmful effects was not due to a varietal resistance is shown by the fact that there was no inhibition of enzyme activity in soft wheat after such treatment.

Rust losing battle in the South, P. C. Mangelsdorf. (Tex. Expt. Sta.). (*South. Seedsman, 2 (1939), No. 11, pp. 6, 29, fig. 1*).—It is noted that by hybridizing the Texas Mediterranean wheat with the rust-resistant Hope variety, new combinations have been obtained which are resistant to both leaf and stem rusts. Some of the better strains are now being increased and in a few more years seed will be generally available. Similar work has given an oat strain resistant to both leaf rust and loose smut, and crosses with varieties resistant to stem rust have been made so that selections resistant to all three diseases are now in the making.

Alfalfa bacterial wilt in Michigan, J. H. Muncie and C. R. Megee (*Michigan Sta. Cir. 171 (1939), pp. 11, figs. 2*).—This bulletin presents detailed information for growers regarding the *Phytomonas insidiosa* wilt and suggested practices for reducing crop losses.

Water-table effects.—IV, Relative incidence of diseases on cucurbits, A. Fikry (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 221 (1939), pp. [2]+9, pls. 19*).—High subsoil water tables in Egypt were found to hasten the appearance and development and to increase the severity of both powdery mildew (*Erysiphe cichoracearum*) and leaf spot (*Colletotrichum lagenarium*) of cucurbits. The growth and yield of vegetable marrow and watermelon with high water table were also distinctly lower. Furthermore, the physiological wilt of watermelons sown from January to May is said to be directly due to a high subsoil water table.

The symptoms of physiological diseases of Lupinus luteus L., V. C. van Gennep (*De Symptomen van physiologische ziekten van Lupinus luteus L. Proefschr., Rijks. Univ., Utrecht, 1936, pp. X+107, [pls. 6, figs. 9]*).—This describes the symptoms of the physiological diseases of European yellow lupine in their relations to Ca, P, Fe, K, Mg, N, B, Mn, Al, Zn, and Cu. Literature references cover over 10 pages.

Viroses of the garden pea (Pisum sativum L.) in Washington, F. Johnson (*Wash. State Col. Res. Studies, 7 (1939), No. 3, pp. 155, 156*).—An abstract.

Disease control and stimulation of cane cuttings by the hot-water treatment, J. P. Martin and R. K. Conant (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 43 (1939), No. 4, pp. 277–285, figs. 7*).—Sugarcane diseases such as gumming, leaf scald, and Sereh have been successfully controlled in other countries by hot-water treatment and, though thus far mosaic has proved refractory, extensive tests here reported have shown that the recently introduced virus chlorotic streak disease may be effectively controlled by hot-water treatment at 52° C. for 20 min., with accompanying stimulation of germination and early growth of most varieties. All observed insects were also killed by this treatment, and it was found that variations between 50° and 52° and between 20 and 25 min. did not alter the results. Furthermore, Ceresan has been found a satisfactory disinfectant for treating the freshly cut ends of cane cuttings for

prevention of the entrance of organisms which under cold, wet conditions often cause a rotting and souring of the cuttings.

Blue mold (downy mildew) of tobacco and its control. (Va., N. C., and S. C. Expt. Stas. et al.). (*Tenn. Univ. Ext. Pub. 221 (1939), pp. 16, figs. 8*).—General information on the disease and its control.

Apple and pear fire blight: Spraying for control of blossom blight, C. D. SHERBAKOFF and J. O. ANDES (*Tennessee Sta. Cir. 64 (1939), pp. [4]*).—From the summarized results of experimental work (1931–39) it is indicated that the spraying of apple and pear trees in full bloom with 1–3–50 bordeaux mixture will give sufficient reduction of blossom blight to assure a fruit crop. Detailed procedures are recommended.

Spray program for apple and peach, 1939, H. A. ROLLINS (*Conn. State Col. Ext. Bul. 270 (1939), pp. 10, figs. 4*).

Studies on the control of blue-mold decay of apples, R. WELLMAN. (Wash. Expt. Sta.). (*Wash. State Col. Res. Studies, 7 (1939), No. 3, pp. 157, 158*).—Abstract of a paper reporting the results of studies on chemical control of *Penicillium expansum*, use of streaming steam for destroying the fungus spores on apple boxes, and the effects of certain factors on the amount of blue mold decay.

Illustrations of South American Elsinoë and Sphaceloma diseases known up to January 1936 [trans. title], A. E. JENKINS and A. A. BITANCOURT. (U. S. D. A. et al.). (*Arq. Inst. Biol. [São Paulo], 10 (1939), Art. 2, pp. 31–60, pls. 11; Eng. abs., pp. 53, 54*).—Illustrations are shown of the 13 known diseases due to these two fungi, with additional data on their history and distribution. There are 88 references.

Life history of "Elsinoë australis," cause of sweet orange fruit scab [trans. title], A. A. BITANCOURT and A. E. JENKINS. (U. S. D. A. et al.). (*Arq. Inst. Biol. [São Paulo], 10 (1939), Art. 7, pp. 129–146, pls. 9; Eng. abs., pp. 140–142*).—The essential points have been referred to in previous notes, especially one in English (E. S. R., 77, p. 208).

Manganese studies Calif. soils and citrus leaf symptoms of deficiency, H. D. CHAPMAN, G. F. LIEBIG, JR., and E. R. PARKER. (Calif. Citrus Expt. Sta.). (*Calif. Citrog., 24 (1939), No. 12, pp. 427, 454, figs. 3; 25 (1939), No. 1, pp. 11, 15, figs. 2*).—The various experiments here briefly described indicate strikingly the effects of pH on manganese availability. Despite regular additions of Mn to the outdoor navel orange sand culture, Mn deficiency symptoms developed when the reaction was maintained at pH 7 or above and disappeared when the pH was lowered. Though many California soils are neutral to alkaline this is not taken to mean that Mn is necessarily required. Its adequacy in soils is probably determined not alone by soil reaction but by many other factors such as the amount and kinds of Mn-bearing substances native to the soil, culture practices, the Mn requirements of the crops grown, perhaps the phosphate status of the soil, and probably also by other factors as yet not understood. Both orange and lemon trees in certain citrus-growing areas of southern California have been observed with leaf symptoms identical with those here described and illustrated. Furthermore, leaf analyses of various sets of leaves from field trees having patterns similar to those described showed a Mn content of 2.7–4.9 p. p. m., whereas green lemon and orange leaves from field trees in other areas showed a content of 14–26 p. p. m.

Black mold disease of rose grafts, L. M. MASSEY and K. LONGREE. (Cornell Univ.). (*Florists Exch. and Hort. Trade World, 93 (1939), No. 18, p. 17, fig. 1*).—This is a note on a disease due to *Chalaropsis thielavioides*, a fungus not hitherto reported on roses.

Summary of 1938 experiences in the selection of elms resistant to the Dutch elm disease due to Graphium ulmi [trans. title], G. GOIDÀNICH and F. AZZAROLI (*Bol. R. Staz. Patol. Veg.* [*Roma*], *n. ser.*, *19* (*1939*), *No. 2*, *pp. 222–240*, *figs. 4*).—The work concerned *Ulmus pumila*, *U. campestris*, hybrids of *U. pumila* with *U. campestris* and other native elms, and the "Cr. Buisman" elm grafted on *U. pumila*.

Determining the time branches on living trees have been dead, S. R. ANDREWS and L. S. GILL (U. S. D. A. et al.). (*Jour. Forestry*, *37* (*1939*), *No. 12*, *pp. 930–935*, *figs. 4*).—Of two methods in common use, one involves the determination of the difference between number of rings in the trunk and the base of the branch, while the other consists in finding the number of rings of callus developed on the trunk after the death of the branch. The first method was found to be very inaccurate while the second is recommended wherever a high degree of precision is essential.

Two pocket rots of hardwood trees, W. H. LONG (*Bul. Torrey Bot. Club*, *66* (*1939*), *No. 9*, *pp. 625–627*, *figs. 4*).—The author describes a butt heart rot of living hardwood trees due to *Fomes extensus* and a honeycomb rot of dead fallen timber induced by *Polyporus rigidus*.

Butt rot in unburned sprout oak stands, E. R. ROTH and B. SLEETH (*U. S. Dept. Agr., Tech. Bul. 684* (*1939*), *pp. 43*, *pls. 11*, *figs. 6*).—Among the 7 oak species included, 22 percent of the 3,246 sprouts felled and dissected in the second-growth forests of the central and eastern United States were affected with butt rot to an average height of slightly more than 3 ft. In 86 percent of these sprouts the fungus causing butt rot had entered from the parent stump and 3 percent through cut or dead companion sprouts, while the remaining 11 percent included undetermined and other entry routes. The height of sprout origin on the parent stump, diameter of stump, old stump wounds, and time of heartwood formation in the sprout proved to be important factors in the entrance of heart-rotting fungi from stump to sprout. Sprouts of high origin and from large stumps were more subject to butt rot than those of low origin and from small stumps. Regeneration following severe burns was usually free of butt rot because the intense heat had destroyed all latent buds above ground. *Stereum gausapatum* was isolated in 62 percent and *Fistulina hepatica* and *Armillaria mellea* each in 10 percent of the determined cases of decay, while the remaining 18 percent consisted of 16 other fungus species. Seven butt rot fungi were cultured at 12–72 in. above any visible incipient decay. Silvicultural treatment of young sprout stands is recommended to reduce the butt rot losses in the final stand.

The cypress bark canker and other cypress diseases, W. W. WAGENER. (U. S. D. A.). (*3. West. Shade Tree Conf., Palo Alto, Calif., 1936, Proc. Ann. Mtg.*, *pp. 79–85*).—A general discussion of the *Coryneum cardinale* canker previously referred to (E. S. R., 81, p. 64), and other cypress diseases, including a *Cytospora* bark trouble and *Armillaria* root rot.

Decay of slash on clear-cut areas in the Douglas fir region, T. W. CHILDS. (U. S. D. A.). (*Jour. Forestry*, *37* (*1939*), *No. 12*, *pp. 955–959*).—Examinations of logging debris on 135 representative slashings west of the Cascade Mountains (Oregon and Washington) indicated that decay of logs is too slow to facilitate fire control materially during the period when rapid control is most likely to be necessary, and that decay causes a marked reduction in the inflammability of slash only after perennial vegetation has shaded it sufficiently to prevent excessive drying. Although a few of the slash-inhabiting fungi are also able to attack living trees, the presence of old slash is not deemed likely to cause appreciable increase of disease in future stands.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Biological control and the theories of the interactions of populations, W. R. THOMPSON (*Parasitology, 31 (1939), No. 3, pp. 299–388, fig. 1*).—Presented with a seven-page list of references to the literature.

A method for determining the numerical status and population level of small mammals in forested regions, W. J. HAMILTON, JR. (Cornell Univ.). (*Bul. Ecol. Soc. Amer., 20 (1939), No. 4, p. 38*).

The European wild boar [Sus scrofa] in the Cherokee National Forest, Tennessee, L. C. STEGEMAN (*Jour. Mammal., 19 (1938), No. 3, pp. 279–290, figs. 3*).

Winter food habits of foxes in Minnesota, D. M. HATFIELD. (Minn. Expt. Sta.). (*Jour. Mammal., 20 (1939), No. 2, pp. 202–206*).—This preliminary study, extending over the period from November 1937 through April 1938, reports on the analysis of the stomach contents of 92 individuals, of which 58 were gray foxes (*Urocyon cinereoargenteus*) and 34 red foxes (*Vulpes fulva*).

Observations on young muskrats in Iowa, P. L. ERRINGTON. (Iowa Expt. Sta.). (*Jour. Mammal., 20 (1939), No. 4, pp. 465–478, figs. 3*).—Field observations of the muskrat (*Ondatra zibethica zibethica*) in Iowa, extending over a 5-yr. period 1934–38, inclusive, in the course of which about 1,900 small-sized young and nearly 800 larger individuals were handled, is reported.

Population studies with Mearns' cottontail, G. O. HENDRICKSON. (Iowa State Col.). (*Bul. Ecol. Soc. Amer., 20 (1939), No. 4, p. 38*).

Hibernation of the striped skunk [Mephitis mesomelas avia] in Iowa, L. F. SELKO. (Iowa Expt. Sta.). (*Jour. Mammal., 19 (1938), No. 3, pp. 320–324*).

Distribution of [the dark-footed woodchuck] Marmota monax in the Missouri Valley region, M. H. SWENK. (Nebr. Expt. Sta.). (*Jour. Mammal., 19 (1938), No. 3, pp. 348–353, fig. 1*).

A bibliography of birds, I, II, R. M. STRONG (*Field Mus. Nat. Hist. [Chicago] Pub., Zool. Ser., 25 (1939), pts. 1, pp. 1–464; 2, pp. 465–937*).—This author catalog of references has been prepared with special reference to anatomy, behavior, biochemistry, embryology, pathology, physiology, genetics, ecology, aviculture, economic ornithology, poultry culture, evolution, and related subjects. An account of the rules and symbols employed (pp. 11–16), a key list of abbreviations for periodicals cited (pp. 17–72), and a list of periodicals not cited but relating to birds (pp. 73–82) are included.

Cooing activity and censusing of the mourning dove, H. E. MCCLURE. (Iowa Expt. Sta.). (*Jour. Wildlife Mangt., 3 (1939), No. 4, pp. 323–328*).—Data on the cooing activity of mourning doves (*Zenaidura macroura*) from March 26 to September 17, 1938, consisting of 2,254 observations, are presented. A method of censusing the birds has been worked out, and census tables are given.

A method of tree climbing, H. E. MCCLURE. (Iowa Expt. Sta.). (*Jour. Wildlife Mangt., 3 (1939), No. 4, pp. 329–331, fig. 1*).—A description is given of a method of tree climbing employed while engaged in observations of the nesting habits of the mourning dove (*Zenaidura macroura*) at an average height of 14 ft. in the country and 22 ft. in town. By this method rope was made use of, since shade or fruit trees were climbed and climbing irons could not be employed.

Effect of artificial ponds on our duck population, S. SAUGSTAD (*North Dakota Sta. Bimo. Bul., 2 (1939), No. 2, pp. 6–8, figs. 2*).—A progress report is made of studies commenced by the station during the summer of 1938 to determine the effect that an artificial pond has upon the plants and animals in its immediate vicinity. The findings have led to an understanding of the

importance of a good stand of coarse vegetation, principally reeds and rushes, which provides some food but particularly cover and protection for the ducks and other aquatic fowl. Although as yet there is but little evidence on which to base conclusions, it does appear that it will require some years for an *artificial pond to acquire the type of vegetation found in natural bodies of* water in North Dakota. The question of artificially introducing certain types of desirable vegetation into impounded water areas is under consideration.

On the occurrence of lead shot in stomachs of North American Gruiformes, J. C. JONES (*Jour. Wildlife Mangt.*, *3* (*1939*), *No. 4*, *pp. 353–357*).—Examination of 1,977 stomachs of North American waterfowl (Gruiformes) from all parts of the United States, representing every month of the year, indicated that the number of lead shot picked up is small, it having been found in but 49 birds. Nearly half of the records were supplied by the sora rail (*Porzana carolina*), where as many as 55 pellets were found in a single stomach. "Among the other species, no single stomach contained more than four shot, the usual number being one, and the percentage of occurrence for each species uniformly low. It is doubtful if the larger forms, the cranes and limpkins, ever take lead shot."

The effect of predator control on ruffed grouse populations in New York, F. C. EDMINSTER. (U. S. D. A.). (*Jour. Wildlife Mangt.*, *3* (*1939*), *No. 4*, *pp. 345–352*).—From the data presented in tables it is concluded that predator control of the types tested is sometimes markedly effective in reducing nesting loss, but does not produce a higher shootable fall population of grouse during years of high grouse abundance. "In years of low grouse abundance during the upswing of the cycle, the evidence shows that predator control may appreciably increase the fall grouse population. But even under these conditions, with the grouse population increasing anyway, the justification for predator control is very doubtful. Whatever control might be thus justified would have to be far more discriminatory than that under which our results were obtained."

Turtles of the United States and Canada, C. H. POPE (*New York and London: Alfred A. Knopf*, *1939*, *pp. XVIII+343+V*, [*figs.*] *99*).—This work presented in 9 chapters, includes a bibliography of 13 pages and a list of the turtles with their scientific and common names.

Protozoology, R. R. KUDO (*Springfield, Ill.: Charles C. Thomas*, [*1939*], *pp. XI+689*, *figs. 291*).—An enlarged and completely rewritten edition of Handbook of Protozoology published in 1931. The subjects of ecology, morphology, physiology, reproduction, and variation and heredity are first dealt with. The taxonomic portion (chapters 7 to 43) is completely rewritten and enlarged. Each of the chapters includes a list of the more important references to the subject under consideration.

A species of plasmodium from the sharp-tailed grouse infective to other birds, P. W. WETMORE (*Jour. Wildlife Mangt.*, *3* (*1939*), *No. 4*, *pp. 361–365*, *pl. 1*).—A description is given of a plasmodium found in the prairie sharp-tailed grouse (*Pedioecetes phasianellus campestris*) in North Dakota while engaged in investigating the cause of loss of weight in this fowl.

[Work in entomology by the Puerto Rico Station]. (Partly coop. U. S. D. A.). (*Puerto Rico Sta. Rpt. 1938*, *pp. 52*, *53*, *65*, *77*, *94–121*, *figs. 7*).—The work of the year referred to (E. S. R., 80, p. 510) includes that with the scale insects *Asterolecanium miliaris* (Bdv.) and *A. bambusae* (Bdv.) as enemies of several bamboo species: earworms (the corn earworm, the fall armyworm, and the corn-silk fly *Euxesta stigmatias* Loew) as the chief limiting factor in sweet corn production; resistance of Puerto Rican wild lima beans to pod borers; introduction of the Amazon fly *Metagonistylum minense* Towns. from British Guiana

and the liberation of adults on the island; receipt of *Theresia claripalpis* V. d. W., a parasite of the sugarcane borer, from Trinidad; introduction of the corn borer parasite *Chelonus annulipes* Wesm. to parasitize the sugarcane moth borer; redistribution of the braconid parasite *Bassus stigmaterus* (Cress.) in the Fajardo district; shipment of adults of the Amazon fly and *Lixophaga diatraeae* to the continental United States; introduction of the coccinellid aphid predator *Coelophora inaequalis* (F.) from Hawaii and recoveries following field liberations; native predatory beetles (*Cycloneda sanguinea* L. var. *limbifer* Csy. and *Hyperaspis* sp.) and an entomogenous fungus (*Acrostalagmus aphidum* Oud.) for the control of the yellow sugarcane aphid *Sipha flava* Forbes; introduction of a second predatory ladybeetle (*Platyomus lividigaster* (Muls.)) from Hawaii to help control *S. flava*; recovery of an introduced parasite (*Spalangia philippinensis* Full.) from the West Indian fruitfly *Anastrepha mombinpraeoptans* Sein puparia and the liberation of *Dirhinus giffardii* Silv., a fruitfly pupal parasite, throughout the island: four natural enemies, the parasite *Cheiloneurus* sp. and the predators *Delphastus* sp., *Scymnillodes* sp., and *Stethorus* sp., of bamboo scales found to be native to Puerto Rico; introduction of the ladybeetle *Chilocorus cacti* (L.) from Texas, Louisiana, and Cuba and *Egius platycephalus* Muls. from Cuba to prey on the bamboo scales; collection in Trinidad, British Guiana, and Surinam (Dutch Guiana) of ladybeetles predatory on the bamboo scales *Asterolecanium miliaris* and *A. bambusae;* liberation at Mayaguez, Yauco, and Cidra of the coccinellid *Curinus* sp. and at Mayaguez of *Delphastus* sp. and *Cryptognatha nodiceps*, all from Trinidad; establishment of *Pentilia castanea* on bamboo and papaya scales and the redistribution of this ladybeetle to other localities; establishment of the red-dotted species of *Pentilia* on bamboo scales; receipt of a predatory coccinellid (*Curinus* sp.) of bamboo scales from Martinique; redistribution of the imported ladybeetle *Azya trinitatis*, an enemy of the coconut scale *Aspidiotus destructor* Sign.; shipment of coconut scale predators (*Azya trinitatis* and *Delphastus* sp.) to Florida; establishment of the pineapple mealybug parasite *Hambletonia pseudococcina* Comp. from Hawaii and the liberation of *Anagyrus coccidivorus* Doz., another introduced parasite of the pineapple mealybug; liberation of adults of the hornfly parasite *Spalangia philippinensis;* receipt from Texas of a dung-rolling beetle, *Canthon pilularius* (L.); the rearing of a hymenopterous parasite (*Muscidifurax raptor* Gir. and Sanders), new to Puerto Rico, from housefly puparia; introduction of a new parasite (*Phanerotoma planifrons* (Nees)) of the lima bean pod borer; a native predacious earwig (*Psalis americana* (Beauv.)) found feeding on the banana root borer; shipments of *Bufo marinus* to Egypt, Mauritius, and the Virgin Islands; investigations for the control of the powder-post beetle *Dinoderus minutus* F. in bamboo through introduction of chemicals by the sap-stream method; two species of *Lyctus* beetles (*L. caribeanus* Lesne and *L. curtulus* Casey) and two species of moth larvae (*Epitomiptera orneodalis* (Guen.) and *Perichares corydon* F.), all recorded from Puerto Rico for the first time, found to do little damage to bamboo; *Entomobrya cubensis* Fols., a species of springtail, found associated with scale on bamboo; slight injury to vanilla by a black weevil (*Diorymerellus* near *obliteratus* Champ.) which was associated with dying back of the tips of the vines, a small leaf tier (*Platynota rostrana* Wlk.) which attacked the tips of the vines, a species of earwig (*Doru* sp.) found in the tips, an aphid (*Cerataphis lataniae* (Boisd.)) which attacked the leaves, and a snail (*Thelidomus lima* Fér.); and serious injury by the larvae of *Terastia meticulosalis* (Guenee) to the bucare (*Erythrina berteroana*) used as living supports for the vanilla vines.

[Work in economic zoology and entomology by the Texas Station]. (Partly coop. U. S. D. A.). (*Texas Sta. Rpt. 1938, pp. 40–47, 101–103, 104, 105,*

109–116, 165, 224, 225, 243–245, 262, 263).—The work of the year reported upon (E. S. R., 81, p. 66) relates to the biology, control, and taxonomy of white grubs (*Phyllophaga* spp.) in Texas, by H. J. Reinhard; the bollweevil, its control and hibernation, by F. L. Thomas, J. C. Gaines, Reinhard, W. L. Owen, Jr., S. E. Jones, and R. W. Moreland; the cotton flea hopper, including varietal resistance, strip planting, relation to previous crops, migration and population, control, and hibernation, by Thomas, Gaines, M. J. Janes, Owen, W. S. McGregor, and Reinhard; the pink bollworm, by Thomas and A. J. Chapman; the bollworm, its hibernation and spring emergence, biology, natural control of eggs and first instar larvae, and control, by R. K. Fletcher and Gaines; the flower thrips on cotton and cotton leaf worm, both by Gaines; pecan insect (pecan nut casebearer and *Acrobasis palliolella* Rag.) investigations, by S. W. Bilsing; devil's shoestring (*Tephrosia virginiana*) as an insecticide, by V. A. Little and G. A. Russell; investigations of truck crop insects, including the turnip aphid, flea beetle *Phyllotreta vittata discedens* Weiss, Hawaiian beet webworm, and corn earworm, by J. N. Roney and Janes; apiary inspection, by C. E. Heard and C. J. Burgin; activities of bees, by H. B. Parks; sweetclover as a honey plant, by Parks and Alex; queen rearing, breeding for resistance to American foulbrood, and horsemint for honey and oil production, all by Alex and Parks; wildlife resources survey in Walker, Kerr, Colorado, and Harris Counties, Tex., by W. P. Taylor, D. W. Lay, P. D. Goodrum, T. F. Smith, V. W. Lehmann, H. R. Siegler, and B. E. Ledeman; quail management, including genetic experiments, winter food of bobwhite, scaled, and Gambel quail, and quail management in the coastal plains and prairie regions of Texas, by D. H. Reid, H. Hahn, Lehmann, and Siegler; ecological wildlife relationships, by Lay; life history and ecology of the gray and fox squirrels in eastern Texas, by Goodrum; the Attwater prairie chicken, by Lehmann; present status and needs of threatened species of animals, namely, peccary, prong-horned antelope, and Texas bighorned sheep, by Taylor and W. B. Davis; pocket gophers of Texas, by Davis; at the Temple Substation, insect pests, including lice, bagworm, flea hopper, bollworm, leaf worm, and others, by C. H. Rogers; at the Sonora Substation, insects affecting animals, by O. G. Babcock; at the Weslaco Substation, citrus insect (rust mite and scale insects) investigations, truck crop insect (worms on broccoli, tomato fruitworm, garden flea hopper on tomatoes, beet webworm, and bean leafhopper) investigations, and tests for the control of the harvester ant, by T. B. Randolph, and of thrips on cotton; and at the Winter Haven Substation, investigations with the corn earworm on tomatoes and aphids on spinach, by Jones, and with the beet leafhopper, onion thrips, and *Pelamia repanda* (on grain sorghum), by Jones and Janes.

[Contributions on economic insects] (*Wash. State Hort. Assoc. Proc., 33 (1937), pp. 17–20, 111–117, 119–127, 153–168*).—The contributions on economic entomology presented at the annual meeting of the Washington State Horticultural Association in December 1937 are: The Role Played by Bees in Pollination (pp. 17, 18) and Substitutes for Lead Arsenate (pp. 111–117), both by R. L. Webster, and Further Experiments With Inverted or "Dynamite" Spray Mixtures, by J. Marshall and K. Groves (pp. 119–127) (E. S. R., 78, p. 368) (all Wash. Expt. Sta.); and Observations With Reference to Arsenic on Apples and Other Foodstuffs, by I. D. Cardiff (pp. 153–168).

Some observations on insect edaphology, W. G. Bruce. (U. S. D. A.). (*Jour. Kans. Ent. Soc., 12 (1939), No. 3, pp. 91–93, fig. 1*).

Investigations of the mechanism of the transmission of plant viruses by insect vectors.—III, The insect's saliva, H. H. Storey (*Roy. Soc.* [*London*], *Proc., Ser. B, 127 (1939), No. 849, pp. 526–543, pl. 1, figs. 2*).—A continuation of the studies previously noted (E. S. R., 80, p. 798).

Cotton growing and cotton pests control, R. W. E. Tucker (*Agr. Jour. [Barbados], 8 (1939), No. 1, pp. 3–7*).

How to recognize some common insect enemies of stored grain, M. D. Farrar and W. P. Flint (*Illinois Sta. Cir. 497 (1939), pp. [8], figs. 12*).—A practical account.

Amaryllis pests, G. Fox Wilson (*Jour. Roy. Hort. Soc., 64 (1939), No. 7, pp. 318–326, pls. 6*).—A brief account of the important insect pests that came to attention during the course of an investigation by the author.

Time of cut as a factor influencing infestation of coniferous logs, P. M. Morley (*Canad. Ent. 71 (1939), No. 11, pp. 243–248*).—Insects of six groups infesting coniferous logs are listed, and details of the effect of time of cut on infestation of pine, spruce, and balsam logs are tabulated.

Importance of chemistry in pest control, R. C. Roark. (U. S. D. A.). (*Pests, 7 (1939), No. 11, pp. 14–17*).

The toxicity of poisons applied jointly, C. I. Bliss (*Ann. Appl. Biol., 26 (1939), No. 3, pp. 585–615, figs. 14*).

An apparatus for testing and comparing the biological action of insecticides on flying insects and a method for sampling the concentration of the atomized insecticide, C. Potter and K. S. Hocking (*Ann. Appl. Biol., 26 (1939), No. 2, pp. 348–364, figs. 8*).—Description is given of an apparatus and a method for testing the effect of atomized sprays on flies and mosquitoes and of a technic for sampling the concentration of insecticide in the air space.

Biological methods of testing insecticides: A review, F. Tattersfield (*Ann. Appl. Biol., 26 (1939), No. 2, pp. 365–384*).—A report of biological methods of testing contact insecticides and stomach poisons, and a consideration of some of the methods of assessing results. This is presented with a list of 87 references to the literature.

***Toxicity* of various *esters* prepared from chrysanthemum monocarboxylic acid, the acidic portion of pyrethrin I**, E. K. Harvill (*Contrib. Boyce Thompson Inst., 10 (1939), No. 2, pp. 143–153*).—Report is made of a study of the toxicity of various esters of chrysanthemum monocarboxylic acid (2,2-dimethyl-3-isobutylene-trimethylene-1-carboxylic acid), the acidic portion of the pyrethrin I ester. The stability of these esters was also noted. "The lauryl, myristyl, cetyl, and diethanolamine esters at a concentration of 0.03 percent showed a kill of 60.4, 62, 65.3, and 63.6 percent toward *Aphis rumicis* as compared to a kill of 70 percent for the pyrethrins at the same concentration. None of the esters produced the typical pyrethrin action when applied to various parts of the cockroach (*Periplaneta americana* L.). Except for the furfuryl and vanillin esters, the compounds prepared showed no signs of decomposition or loss of toxicity after 6 mo. This suggests that the instability of the pyrethrins is due to the ketonic alcohol, pyrethrolone."

Experiments on *greenhouse fumigation* with β,β′-dichloroethyl ether, F. Wilcoxon and A. Hartzell (*Contrib. Boyce Thompson Inst., 10 (1938), No. 1, pp. 47–56, fig. 1*).—Tests made of β,β′-dichloroethyl ether as a greenhouse fumigant have shown that it will control the bean aphid, common red spider, gladiolus thrips, and greenhouse whitefly. The plant species most susceptible to injury included rose, peach, castor-bean, and carnation. In studies of three different methods of volatilization of the fumigant, the use of the pure compound in shallow pans, with vertical porous plates dipping in the liquid to give increased evaporation area, was the most promising from a practical standpoint. Circulation of the greenhouse air was maintained through the use of an electric fan. Plant tolerance has been tested on 44 species of plants.

Basic copper arsenate: A new insecticide for bean and potato pests, D. M. DeLong, H. A. Waters, and E. D. Witman. (Ohio State Univ.). (*Ohio Veg. and Potato Growers Assoc. Proc., 24 (1939), pp. 86–92, figs. 2*).—The results of experiments, in which the newly produced basic copper arsenate, Cu ($CuOHAsO_4$), was used against bean and potato pests especially, are reported. In tests in both the laboratory and the field this insecticide, applied at a strength of 1 lb. to 100 gal. of water, controlled all of the larvae of the Mexican bean beetle in 24 hr. It was found necessary to use 3 lb. to 100 gal. of spray in order to control the adults, as is also the case with calcium arsenate and lead arsenate. Similar results were obtained with the Colorado potato beetle used as a test insect. A dust containing 25 percent basic copper arsenate gave excellent control of both the Mexican bean beetle and the Colorado potato beetle. Basic copper arsenate dust was found to have a high repellent effect upon the potato leafhopper and affords a degree of protection for the plant for several days after application if the plant remains dry. This insecticide was shown to be more toxic to the southern armyworm larvae than acid lead arsenate. The low phytotoxicity of basic copper arsenate can be correlated with its low water soluble arsenic value as determined by the air bubble test and to its stability in the presence of such chemicals as weak acids, salts, etc. It has the lowest soluble arsenic figure of any effective arsenical insecticide tested, and has proved to be the safest of all the arsenicals when applied to plant foliage.

Derris stability: Effect of temperature and light upon the decomposition of derris, R. D. Chisholm. (U. S. D. A.). (*Soap, 15 (1939), No. 5, pp. 103, 105*).

Insect repellents: A study of comparative repellency by the sandwich-bait method, using confined house flies, L. B. Kilgore (*Soap, 15 (1939), No. 6, pp. 103, 105, 107, 109, 111, 123, figs. 2*).—A description is given of a laboratory procedure that has been developed for evaluating liquid materials soluble in alcohol as insect repellents in which the housefly is used as the test insect. "The method consists in (1) preparing uniform baits, using brown molasses as the lure; (2) thwarting the attack of flies when the baits are exposed to them in a cage by superimposing on the bait a porous paper cover impregnated with the material to be tested to form a sandwich; [and] (3) introduction of the chemical citronellol as a standard insectifuge. Some results obtained by this method are included, illustrative of the applicability of the proposed procedure."

Insect electrocutor traps: What about them? T. H. Parks and I. P. Blauser. (Ohio State Univ.). (*Ohio Veg. and Potato Growers Assoc. Proc., 24 (1939), pp. 97–102, 104, 106, 108, 110, figs. 4*).—It is concluded from two seasons' work with electrocutor traps that their use is still in the experimental stage and cannot be depended upon to reduce insect damage greatly in outside locations where long distance migrants of many species are caught.

The common dry-wood termite, P. A. Harvey (*California Sta., [1939], pp. [4]*).—A brief practical account of *Kalotermes minor* (Hagen) and means of control.

Psocids: Annoying house pests, E. A. Back (*U. S. Dept. Agr. Leaflet 189 (1939), pp. 4*).—A brief practical account of psocids as annoying yet harmless household pests and means of combating them.

The mullein thrips [Neoheegeria verbasci (Osborn)], S. F. Bailey. (Univ. Calif.). (*Pan-Pacific Ent., 15 (1939), No. 3, pp. 111–116, fig. 1*).

Mass flights of the pentatomid Thyanta custator (Fabr.) in Kansas, D. A. Wilbur. (Kans. Expt. Sta.). (*Jour. Kans. Ent. Soc., 12 (1939), No. 3, pp. 77–80, fig. 1*).

Factors affecting curly-top infectivity of the beet leafhopper (Eutettix tenellus), H. H. P. SEVERIN. (Coop. U. S. D. A.). (*Hilgardia [California Sta.], 12 (1939), No. 8, pp. 497–530, pls. 4, fig. 1*).—The finding by a number of investigators that large numbers of beet leafhoppers collected in the foothill breeding areas and on weeds in the cultivated areas fail to transmit the curly top virus to sugar beets led to the work here reported, the details of which are given in tables. It was determined that higher percentages of infective adults of the spring generation usually occurred in the northern canyons of the San Joaquin Valley than in Little Panoche Pass, situated in the middle San Joaquin Valley about 80 miles away from the nearest beet fields. In all probability many overwintering adults reared on curly top beets flew into the northern canyons and spread the virus to susceptible plants, and hence higher percentages of infective adults of the spring generation resulted. There was found to be a decrease in the percentage of beets infected during successive 30-day periods by adults kept on plants immune to curly top and transferred singly to beets for 1 day. Many of the infective beet leafhoppers apparently lost the capacity to produce infection. There appears to be a correlation between the percentages of infective beet leafhoppers of the spring generation and early or late germination of the seeds of the pasture vegetation by autumn or early winter rainfall in Little Panoche Pass.

"With the additions reported in this paper, 75 species of plants in 48 genera belonging to 18 families, including 59 species of annuals, 1 annual or short-lived perennial, 3 biennials, 1 biennial or short-lived perennial, and 11 perennials, have been demonstrated to be naturally infected with curly top. Three species of perennials growing on the uncultivated plains and foothills were found to be naturally infected with curly top, but 16 species of perennials which serve as food plants of the beet leafhopper during dry autumns and early winters were not susceptible to the disease. The longer the overwintering adults are forced to feed on perennials nonsusceptible to curly top during dry autumns and early winters on the uncultivated plains and foothills, the shorter is the period remaining for infectivity, and hence the less the spread of the disease to susceptible annuals after their seeds germinate. . . . Perennial seedlings, such as quail bush or lenscale (*Atriplex lentiformis*) and Australian saltbush or fleshscale (*A. semibaccata*), showed a high degree of resistance to the disease. The virus was recovered from infected seedlings of *A. lentiformis*, but 1 yr. later the virus was not recovered from these same plants. When these plants were reinfected, the virus was recovered from 2 of 8 plants. Seedlings of *A. semibaccata* were rarely infected with curly top, and large old plants were immune. The virus was not recovered from 1 of 3 infected seedlings 23 days after the first recovery of the virus." The recovery of the virus from weeds which serve as the most important breeding plants of the beet leafhopper obtained with single noninfective leafhoppers which fed on the infected weeds for periods of 2, 4, and 8 days, and with single adults which completed the nymphal stages on the infected weeds is also reported in detail in tables. "The most favorable virus reservoir was *A. bracteosa*, followed by *A. argentea* subsp. *expansa*, then *A. rosea*, and lastly Russian-thistle. The virus was recovered from all infected plants of the 3 species of saltbushes, but 15 of 69, or 18.8 percent, of the Russian-thistles were immune."

A list is given of 23 references to the literature cited.

Leafhopper control, C. S. BECKWITH. (N. J. Expt. Stas.). (*Amer. Cranberry Growers' Assoc., Proc. Ann. Conv., 70 (1939), pp. 7–9*).—A brief account of means of control of the blunt-nosed leafhopper *Ophiola striatula*, one of the important enemies of cranberry culture.

Some mealy bugs of Egypt and experiments on their control by means of chemicals, M. Beshir and M. Hosny (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 209 (1939), pp. [1]+16*).—The species of mealybugs of considerable importance in Egypt here considered include the hibiscus mealybug *Phenacoccus hirsutus* Green, the citrus mealybug, the lebbek mealybug *Pseudococcus filamentosus* Ckll., the sugarcane mealybug *P. sacchari* Ckll., the Egyptian mealybug *Icerya aegyptiaca* Doug., and the cottony-cushion scale. *Phenacoccus hirsutus*, a serious pest of fruit and shade trees and economically the most important coccid pest, was used in the control work.

The use of a bamboo pole drag in enhancing the value of dusts in the control of the pea aphid, J. B. Maltais (*Canad. Ent., 71 (1939), No. 11, pp. 240, 241, fig. 1*).—A description is given of a simple device in the form of a bamboo pole drag attached to the 33-ft. distribution boom of the power duster, by use of which aphids are dislodged from their protected quarters and fully exposed to the effects of the rotenone-bearing dust.

A comparative study of the transmission of Hyoscyamus virus 3, potato virus Y, and cucumber virus 1 by the vectors Myzus persicae (Sulz), M. circumflexus (Buckton), and Macrosiphum gei (Koch), M. A. Watson and F. M. Roberts (*Roy. Soc. [London], Proc., Ser. B, 127 (1939), No. 849, pp. 543–576, pl. 1*).—Of the three aphid species tested, *Myzus persicae* was the most successful and *Macrosiphum gei* was the least successful in virus transmission.

A new aphid of the genus Mindarus from white fir in British Columbia (Homoptera, Aphididae), E. O. Essig. (Univ. Calif.). (*Pan-Pacific Ent., 15 (1939), No. 3, pp. 105–110, figs. 2*).—An aphid collected on the undersides of the young, tender tips of grand fir or white fir (*Abies grandis*) in Victoria, B. C., is described as new under the name *M. victoria*.

Three intermountain aphids, C. F. Smith and G. F. Knowlton. (Utah Expt. Sta. and Ohio State Univ.). (*Canad. Ent., 71 (1939), No. 11, pp. 241–243, fig. 1*).—Three aphids, namely, *Amphorophora crystleae*, collected on leaves of *Lonicera involucrata* in Idaho and Utah, *Macrosiphum aetheocornum* from the wild geranium (*Geranium* sp.) in Utah, and *M. crenicornum* from the wild geranium in Utah and Idaho, are described as new.

The residue problem in cabbage worm control, H. L. Gui. (Ohio Expt. Sta.). (*Ohio Veg. and Potato Growers Assoc. Proc., 24 (1939), pp. 92–97*).—The residue on cabbage resulting from the application of a dust consisting of 1 lb. of paris green and 9 lb. of talc, the details of which are given in tables, is shown to have been well within the legal tolerance. The only approach to the tolerance of 0.01 gr. per pound occurred after four applications had been made.

Some notes on "the potato tuber moth" Phthorimaea operculella Zell., R. Attia and B. Mattar (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 216 (1939), pp. [3]+136, pls. 5, figs. 36*).—This report of studies on the life history, habits, and morphology of and control measures for the potato tuber moth *P. operculella* is presented with a list of 213 references to the literature. A complete list of species of the genus *Phthorimaea* compiled from the literature, 79 in number, with references to the original descriptions, is included.

Heavy emergency spraying stops codling moth increase, R. Hutson (*Michigan Sta. Quart. Bul., 22 (1939), No. 2, pp. 111, 112*).—Work aimed at a determination of the possibility of stopping an infestation of codling moth after first brood larvae have commenced to enter the apples in numbers was brought about by a late frost (May 13) in a planting of Northern Spy trees which had materially reduced and in some orchards eliminated the crop. An

inspection on July 4 of the Spy orchard, to which no further sprays had been applied after May 13, revealed a crop of possibly 10 bu. per tree. "Following these findings, on July 6 and 7 the planting was laid out in four series of three plats with four spray treatments of five applications each planned. This permitted triplication of plats with a better chance of valid findings. The first two sprays were applied July 7 and July 9. The three other subsequent sprays were applied at 10-day intervals thereafter. It should be noticed that the first two sprays were applied within 2 days of each other. This was done to insure thorough coverage. Further insurance of thorough coverage was afforded by the application of excessive amounts of spray at these two times. Approximately 40 gal. of spray were applied in each of these initial applications, for the trees were large and dense. Subsequent applications were at the usual rate of 15–18 gal. for trees of that size. The four spray treatments, each in 100 gal. of water, were as follows: (1) Lead arsenate, 3 lb.; (2) Fixator (bentonite base), 4 lb., plus 1 pt. nicotine sulfate, plus ½ pt. soy oil; (3) B. L. 155, 4 lb., plus ½ gal. summer oil emulsion; [and] (4) double strength 155, 2 lb., plus 1 pt. soy oil."

The finding of clean fruit July 9 and at harvest "indicate that all of these treatments held the increase of codling moth which we expect from first to second brood to a low rate. We should normally expect that with an infestation of the magnitude indicated by the counts of July 9 that practically all apples would have been infested by harvest time. Instead of all apples being infested, however, we see that while the percentage of clean fruit decreased (or wormy apples increased) on all plats, in no case was the decrease of clean apples (or increase of wormy apples) as much as the 10 percent ordinarily considered necessary for significance in field experimentation."

Codling moth control in the western province, with special reference to the coastal areas, W. A. K. Stubbings and R. I. Nel (*Farming in So. Africa, 14 (1939), No. 163, pp. 406–409, 420, fig. 1*).

A cecidomyid larva infesting flowering stems of lilies, E. P. Imle and A. Hartzell (*Contrib. Boyce Thompson Inst., 10 (1939), No. 3, pp. 277–279, fig. 1*).—The so-called mallow stem midge *Neolasioptera hibisci* Felt has been found by the authors affecting the stems of *Lilium auratum* growing in nursery rows at Yonkers, N. Y. The larvae were feeding in the pith and in some instances had infested as much as the top third of the stem. They were also found in the flower pedicels. Such infestation caused the buds to be blasted or withered, and in some instances the larvae had penetrated from the pedicels into the buds, boring through the ovary tissue and half way the length of the style. Small exit holes were found on the upper part of the stem to which cocoons were often attached. Reference is also made to later reports that this pest has been found attacking *L. formosanum*, *L. speciosum*, and *L. auratum* in other localities.

Some gall midge species and their host plant range, H. F. Barnes (*Ann. Appl. Biol., 26 (1939), No 2, pp. 318–347, pl. 1*).—Studies of the *Arabis* midge *Dasyneura alpestris*, the chrysanthemum gall midge (*Diarthronomyia hypogaea* Loew), the black currant leaf midge *Dasyneura tetensi*, and the hawthorn stem midge (*Thomasiniana crataegi* n. sp.), particularly as relate to their host plant range, are considered. A list of 53 references to the literature is included.

The chrysanthemum midge in Northern Ireland, R. Chamberlain (*Agr. Prog. [Agr. Ed. Assoc., Gt. Brit.], 16 (1939), No. 2, pp. 202–206*).—A brief account is given of an outbreak of the chrysanthemum midge in the north of Ireland and the unusual steps taken to prevent its establishment.

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Mosquito transmission of encephalomyelitis, or brain fever, of horses, F. C. BISHOPP. (U. S. D. A.). (*Jour. Wash. Acad. Sci., 29 (1939), No. 11, pp. 495–501*).—This review is presented with 15 references to the literature.

New Utah Dolichopodidae (Diptera), F. C. HARMSTON and G. F. KNOWLTON. (Utah Expt. Sta.). (*Ent. News, 50 (1939), No. 9, pp. 256–259, fig. 1*).—Three dipterous species of the family Dolichopodidae occurring in Utah are described as new.

Three new Dolichopodidae, F. C. HARMSTON and G. F. KNOWLTON. (Utah Expt. Sta.). (*Jour. Kans. Ent. Soc., 12 (1939), No. 3, pp. 83–86, fig. 1*).—The species *Dolichopus facirecedens* from South Dakota and Iowa, *D. iowaensis* from Iowa, and *Argyra dakotensis* from South Dakota are described as new to science.

An account of the developmental stages of some aphidophagous Syrphidae (Dipt.) and their parasites (Hymenopt.), E. I. SCOTT (*Ann. Appl. Biol., 26 (1939), No. 3, pp. 509–532, pls. 6*).—Following a discussion of the developmental stages of some aphidophagous Syrphidae, a key is given for the identification of syrphid pupae. Some hymenopterous parasites reared from syrphid pupae then dealt with include nine species of Ichneumonoidea, two of Chalcidoidea, and three of Proctotrupoidea.

Siphonaptera: A list of Alaskan fleas, W. A. JELLISON and G. M. KOHLS (*Pub. Health Rpts. [U. S.], 54 (1939), No. 45, pp. 2020–2023*).—A list is given with hosts and localities of 17 forms of fleas known to occur in Alaska.

The fleas of China (order Siphonaptera), C. Y. LIU (*Philippine Jour. Sci., 70 (1939), No. 1, pp. 122, figs. 132*).—In this contribution an attempt is made to summarize the present knowledge of the Siphonaptera of China and to bring together their descriptions. Keys to families, subfamilies, genera, and species, as well as descriptions of salient characters, are included. Seventy-five forms, representing 29 genera, are recognized. A host list of these forms and a bibliography of 128 titles are presented. Descriptions of two new species and one new genus are included.

External anatomy and diagnostic characters of some common Philippine white grubs, G. B. VIADO (*Philippine Agr., 28 (1939), No. 5, pp. 339–409, pls. 10*).—This contribution includes a larval key to the species.

Some recent observations on the activities of Phyllophaga lanceolata Say (Scarabaeidae), H. R. BRYSON. (Kans. Expt. Sta.). (*Jour. Kans. Ent. Soc., 12 (1939), No. 3, pp. 94–96*).—The observations reported indicate that the wheat white grub *P. lanceolata* possesses potentialities as a pest of golf courses in central Kansas. "A cycle of ecological conditions may result in the perpetuation of the species on the areas and the grass may be greatly injured by its presence. The larvae and close clipping tend to destroy the grass on the fairways. Dandelions grow on the denuded spots and furnish food for the females as well as a place under which they can burrow and deposit eggs to produce more larvae. The situation is one which will command careful consideration where the conservation of the turf has become a problem."

Factors affecting the resistance of the [confused] flour beetle (Tribolium confusum Duv.) to hydrogen cyanide, H. C. GOUGH (*Ann. Appl. Biol., 26 (1939), No. 3, pp. 533–571, pls. 2, figs. 10*).—A description is given of two types of apparatus for exposing insects to known concentrations of toxic gases under controlled conditions. It is pointed out that while the experiments described must be regarded as preliminary, they emphasize "the complexity of the problems arising in the study of the resistance of living organisms to toxic substances, the need for carrying out such experiments under as natural condi-

tions as possible, [and] the importance of a careful analysis of factors which affect the resistance of the organism."

The vegetable weevil, M. M. High (*U. S. Dept. Agr. Cir. 530 (1939), pp. 26, figs. 12*).—Studies of the more important habits of the vegetable weevil, conducted with a view to the development of cultural and insecticidal means of control, are reported. The work was carried on in southern Mississippi, principally at Gulfport and Biloxi, during the period 1924–36. This weevil, an important economic pest in the Southern States and in California, was first discovered at McHenry, Miss., in March 1922 and appeared first in California in 1925. It attacks a large number of vegetables, among which are turnips, carrots, mustard, spinach, tomatoes, and potatoes, as well as ornamental flowering plants and many wild plants. "In the Southern States the insect is active throughout the fall, winter, and spring, and estivates during the summer months. It deposits its eggs on the plants and on or in the soil nearby. The larvae cause injury by devouring the foliage and roots of plants. The adults cause the greatest damage in the spring just after emerging. In the Southern States there is only one generation of the insect annually. The length of the developmental period depends on weather conditions. In Mississippi this period ranged from 48 to 111 days. No parasites of economic importance have been observed. Domestic fowls are efficient in cleaning up infestations in small gardens and small fields. Several species of birds, ants, and spiders also prey upon the weevil, but none of these can be relied on to effect control over large areas. Although satisfactory control methods for the vegetable weevil have not yet been devised, clean cultivation, crop rotation, poisoned baits, and insecticides, when they can be safely used from the standpoint of human health, have been found to aid greatly in curtailing damage caused by the pest."

A list is given of 18 references to the literature cited.

Bark beetle transmission of the Dutch elm disease, J. J. Fransen (*Iepenziekte, iepenspintkevers en beider bestrijding. Proefschr., Landb. Hoogesch., Wageningen, 1939, pp. [8]+118, [figs.] 3; Eng. abs., pp. 105–112*).—This contribution, presented with a six-page list of references to the literature, deals with the bark beetle transmission of *Ceratostomella ulmi* (the fungus agent of Dutch elm disease), the feeding period of *Scolytus scolytus* F., generations and epidemiology of the beetles, and control of the disease. It was nearly always possible to isolate *C. ulmi* from the larvae and adults of the larger European elm bark beetle (*S. scolytus*). Since the fungus was never found in the pupae, it is concluded that the beetles must become newly infected in each brood. The elm bark beetles are found contaminated externally with the spores of several fungi, especially *Fusarium* sp., *Phomopsis* sp., and *C. ulmi*. The smaller European bark beetle (*S. multistriatus* Mrsh.) is also frequently infected with *C. ulmi*. "In the pupal cells of both elm bark beetles *C. ulmi* is found fructifying, only, however, in wet and warm weather. During a dry or cold period the fruit bodies of this fungus do not appear. It has been proved that the beetles are newly infected in the pupal cells and that they transport the fungus to the new egg tunnels. The fungus does not grow in attacked elms out from the wood to the inner bark." The mite *Pseudotarsonemoides innumerabilis* Vitzth, living on the elm bark beetle, is transported by these beetles to the newly cut egg tunnels, and from these tunnels the mites transport the spores of *C. ulmi* by way of the larval tunnels to the pupal cells where they disseminate the spores in such a way that these form a typical sward of coremia. It has been proved by field experiments that the elm bark beetles when feeding infect the healthy elm trees which they attack.

Damage to red pine nursery stock by the small pine sawyer [Monochamus scutellatus Say.], M. W. Day (*Michigan Sta. Quart. Bul., 22 (1939), No. 2, p. 118*).—Attention is called to the fact that, in addition to the damage to red pine nursery stock by the white-spotted sawyer through the adults feeding on the green bark of the twigs during the flight period, another type of injury may occur. The beetle was found in July and August 1938 damaging 4-year-old red pine transplants and 3-year-old seedlings in the forest tree nursery by chewing away the bark and cambium tissues along one side of the leader. In some cases the leader was nearly severed. The trees did not die at once but were so badly damaged as to be unsuitable for planting. Because of the small size of the nursery, satisfactory control was effected by hand-picking the beetles from the infested nursery beds.

Damage to Norway spruce plantations by the white pine weevil, M. W. Day (*Michigan Sta. Quart. Bul., 22 (1939), No. 2, pp. 117, 118*).—In two small plantations of Norway spruce established at the Dunbar Forest Experiment Station near Sault Ste. Marie, Mich., it was found that the damage caused by the white-pine weevil differed somewhat from the typical damage to white pine (*Pinus strobus* L.). While in white pine the damage is usually confined to the leaders of the current and preceding year, in the Norway spruce the damage was often more widespread, sometimes extending to growth made from 3 to 5 years before. The reduction in height was observed to be greater than in the case of white pine. Since the tendency toward axial growth is apparently not so pronounced in Norway spruce as in white pine, the damage to the main stem is much more difficult to overcome and results in more pronounced deformation. The findings led to the conclusion that white-pine weevil damage should be seriously considered before establishing pure plantations of Norway spruce in close proximity to stands of white pine.

New recomendations for the installation of package bees, using a spray and direct-release method, C. L. Farrar (*Ill. State Beekeepers' Assoc. Ann. Rpt., 38 (1938), pp. 96–101*).

Beekeeping for the beginner, F. Taylor (*Union So. Africa Dept. Agr. and Forestry Bul. 199 (1939), pp. 108, figs. 88*).—A practical account.

Motile colonies of Bacillus alvei and other bacteria, N. R. Smith and F. E. Clark. (U. S. D. A.). (*Jour. Bact., 35 (1938), No. 1, pp. 59, 60*).—Observations of motile colonies of the foulbrood organism *B. alvei* are reported.

Nonmotile variants of Bacillus alvei, F. E. Clark. (U. S. D. A.). (*Jour. Bact., 38 (1939), No. 5, pp. 491–497*).—Following the original demonstration of colony motility in *B. alvei*, above noted, additional cultures isolated from foulbrood of bees were received which likewise show colony migrations. All of the author's isolates from soil, considered identical with named cultures of *B. alvei*, have shown motile colonies. "From a culture of *B. alvei* showing motile colonies on dried agar surfaces, variant daughter strains which fail to show colony motility were obtained by selective picking. Such nonmotile variants showed reversion to the motile type when aged in glucose broth. Lack of colony motility is associated with lack of demonstrable flagella, the presence of a large amount of extracellular or capsular material, and with a granular, rather than a turbid, type of growth in broth. Otherwise, the nonmotile variants were identical with the motile parent culture, even insofar as showing orientation of spores in long lateral rows."

The European spruce sawfly in New Hampshire 1938, H. I. Baldwin (*Jour. Forestry, 37 (1939), No. 11, pp. 876–878*).—A summary of the status of the European spruce sawfly in New Hampshire, where it was first observed in 1929.

Contribution to the biology and control of the apple and pear sawflies (Hoplocampa testudinea Klg. [and] Hoplocampa brevis Klg.) (Hym. Tenthr.) [trans. title], H. VELBINGER (*Gartenbauwissenschaft, 13 (1939), No. 4, pp. 492–566, figs. 48*).—This report of studies includes a list of 49 references to the literature.

A gamasid mite, Typhlodromus thripsi n. sp., a predator of Thrips tabaci Lind., E. I. MACGILL (*Ann. Appl. Biol., 26 (1939), No. 2, pp. 309–317, figs. 15*).—A new predaceous mite, which occurs on greenhouse plants in Manchester, England, and prevents injury to cotton seedlings by the onion thrips, is described as *Typhlodromus thripsi*.

Methyl bromide fumigation for mites on cyclamens, F. F. SMITH and R. LATTA. (U. S. D. A.). (*Florists Exch. and Hort. Trade World, 93 (1939), No. 19, pp. 14, 15, figs. 2*).

Observations on the distribution and ecology of the oribatid mites, W. H. KRULL. (U. S. D. A.). (*Jour. Wash. Acad. Sci., 29 (1939), No. 12, pp. 519–528*).—This contribution on oribatid mites, which recently have been incriminated as intermediate hosts of tapeworms of livestock, considers the method of collecting, observations on the ecology and food habits, and methods of culturing. These mites, recently studied in the region of Beltsville, Md., were most abundant on grass after rains sufficient to saturate the ground, and "they retained their greatest constancy in areas where moisture was plentiful enough to prevent limitation of the growth of grass. Numerous mites of the various species recorded could be collected from sheep pastures. Water, light, wind, and food are factors that were found to be important in influencing the vertical distribution of the mites on grass. A striking increase in the number of mites on grass was observed at the time the spring growth of grass was 3 in. tall. Mites kept under controlled conditions ate hyphae and spores of fungi, debris, cellular material of blades of dead grass, and anoplocephaline tapeworm eggs. Numerous mites of the various species recorded were dissected and examined for cysticercoids of *Moniezia expansa*, which were found only in *Galumna emarginata*. This mite was generally distributed, could be collected at all seasons during which the investigation was in progress, and was taken only rarely in greater numbers than five per pound of grass."

The economic importance of Ixodes ricinus, W. L. STEWART (*Vet. Jour., 95 (1939), No. 9, pp. 341–349*).—A discussion of the economic importance of the British sheep tick *I. ricinus*, which, in addition to being a bloodsucking parasite of mammals and birds, transmits several widely spread and fatal diseases of sheep and of cattle. The use of a powdered preparation of derris root was found to be the method of choice in rendering lambs tick free. Such dusting, which is quickly and easily carried out, produces no ill effects, and dusted lambs remained remarkably tick free for more than 2 weeks.

On Yugoslavian (Balkan) ticks (Ixodoidea), B. OSWALD (*Parasitology, 31 (1939), No. 3, pp. 271–280, figs. 2*).—This contribution includes a list of 23 species of Yugoslavian ticks, several of which occur in the United States.

ANIMAL PRODUCTION

[Livestock investigations in Texas] (Partly coop. U. S. D. A.). (*Texas Sta. Rpt. 1938, pp. 12, 17, 18, 19, 20, 36–38, 39, 40, 91–93, 95–97, 126–128, 181–183, 188, 189, 200–202, 211, 212–215, 217, 221*).—Progress reports (E. S. R., 81, p. 86) of beef cattle investigations at the station and substations, by J. M. and J. H. Jones, W. H. Black, L. H. Tash, G. S. Fraps, A. R. Kemmerer, R. E. Dickson, J. K. Riggs, H. Schmidt, F. E. Keating, R. A. Hall, E. M. Neal, J. J.

Bayles, E. K. Crouch, R. L. Hensel, E. B. Reynolds, W. H. Dameron, V. L. Cory, E. C. Compton, I. B. Boughton, and W. T. Hardy, include those on the vitamin A requirements of beef cattle; pathological conditions accompanying vitamin deficiencies; the efficiency of feed utilization and the carcass quality of feeder calves fed singly and in groups, when full-fed and when fed limited rations; mineral deficiency studies in range cattle production; the value of dried citrus peel and pulp and of ground rice hulls in rations of fattening beef cattle; self-feeding concentrates to yearling steers on Sudan grazing; the use of silage in steer-fattening rations, and the optimum levels of cottonseed meal and/or cottonseed as supplements to silage, sumac silage v. kafir silage for steers, and the feeding value of cottonseed oil; the maximum use of roughages and the optimum ratio of hegari fodder to alfalfa hay in fattening rations; the mineral and protein deficiencies in pastures in the east Texas forest region and the returns secured from improved pastures of the region; the effect of various systems of grazing and rates of stocking with cattle alone, sheep alone, or cattle and sheep on the quality of range, and the returns secured from range grazing in southwest Texas; and feeding experiments with bonemeal and salt mixture.

Reports of studies with sheep, by J. H. and J. M. Jones, Dickson, Riggs, Schmidt, Fraps, Kemmerer, Dameron, O. L. Carpenter, Boughton, S. P. Davis, and B. L. Warwick, include the vitamin A requirements, serum calcium and inorganic phosphorus, grazing spineless cactus (*Opuntia ellisiana*) with sheep, the management of sheep on bitterweed range, and the accuracy of small wool samples for shrinkage tests.

Reports of swine investigations, by F. Hale, J. H. Quisenberry, Fraps, and Kemmerer, include the relationship of genetic factors to vitamin A requirements in mammals, the calcium requirements of pigs fed rations balanced with cottonseed meal, the vitamin A requirements of pigs, and the value of Sudan grass and oats pasture, and of concrete wallows for fattening hogs.

Poultry studies, by R. M. Sherwood, J. R. Couch, Fraps, and Kemmerer, gave information on the vitamin A requirements of chicks and hens, the vitamin D requirements of chickens, the effect of sulfur in the diet on the carotene requirements of chicks, the effect of adding manganese to a standard chick ration on the incidence of perosis, and the calcium and phosphorus requirements of chicks.

Chemical studies, by Fraps, Kemmerer, and J. F. Fudge, deal with the relation of soil composition to plant and animal deficiencies, the stability of vitamins in mixed feeds during storage, methods for carotene determination and vitamin D assays, and the iodine content of feeds, foods, and waters.

Animal nutrition (*U. S. Dept. Agr. Yearbook 1939, pp. 405–1074, figs. 104*).—This portion of the yearbook, noted as a whole on page 573, contains the following articles: Sources and Cycles of the Nutritive Elements, by E. J. Kraus (pp. 405–417); The Digestive Processes in Domestic Animals, by H. W. Schoening (pp. 418–430); Factors Affecting Maintenance Nutrition, Feed Utilization, and Health of Farm Animals, by L. L. Madsen (pp. 431–449); Growth, Fattening, and Meat Production, by O. G. Hankins and H. W. Titus (pp. 450–468); Some Effects of Nutritional Levels, by P. E. Howe (pp. 469–475); The Relation of Diet to Reproduction—Reproductive Failures in Livestock, by R. W. Phillips (pp. 476–482), and Nutrition and Reproduction, by M. H. Friedman and W. A. Turner (pp. 482–491); The Relation of Nutrition to the Production of Hides and Wool, by J. I. Hardy and I. P. Earle (pp. 492–500); The Nutrition of Very Young Animals, by I. P. Earle (pp. 501–518); Nutritional Requirements of Beef and Dual-Purpose Cattle, by W. H. Black, B. Knapp, Jr., and J. R. Douglas (pp. 519–543); Practices in the Feeding of Beef and Dual-Purpose Cattle, by W. H. Black (pp.

544–565); The Feeding of Dairy Cows for Intensive Milk Production in Practice, by E. B. Meigs (pp. 566–591); Figuring the Rations of Dairy Cows, by T. E. Woodward (pp. 592–596); Practical Feeding and Nutritional Requirements of Young Dairy Stock, by J. B. Shepherd and H. T. Converse (pp. 597–638); Variations in the Composition of Milk, by P. A. Wright, E. F. Deysher, and C. A. Cary (pp. 639–648); Utilization of Feed Energy and Feed Protein in Milk Secretion, by C. A. Cary (pp. 649–667); The Vitamins in Milk and in Milk Production, by C. A. Cary (pp. 668–684); Glands, Hormones, and Blood Constituents, Their Relation to Milk Secretion—Endocrine Factors, by M. H. Friedman (pp. 685–694), and Blood Constituents, by C. A. Cary (pp. 694–698); Milk in Nutritional Research—A Sketch of Progress, by C. A. Cary (pp. 699–705); Nutritive Requirements of Swine, by N. R. Ellis and J. H. Zeller (pp. 706–722); Practices in Swine Feeding, by J. H. Zeller and N. R. Ellis (pp. 723–745); Feeding Problems With Sheep, by D. A. Spencer (pp. 746–757); Feeding Problems With Goats, by D. A. Spencer (pp. 758–762); Nutrition of Horses and Mules, by E. B. Krantz and S. R. Speelman (pp. 763–786); Practical Nutritive Requirements of Poultry, by H. W. Titus (pp. 787–818); Practical Feeding of Poultry, by H. W. Titus (pp. 819–843); Nutritional Requirements of Dogs, by I. P. Earle (pp. 844–855); Feeding Dogs, by S. R. Speelman (pp. 856–870); Nutrition of Fur Animals, by C. E. Kellogg (pp. 871–892); Feeding Requirements of Gallinaceous Upland Game Birds, by R. B. Nestler (pp. 893–924); Pasture and Range in Livestock Feeding, by P. V. Cardon, W. R. Chapline, T. E. Woodward, E. W. McComas, and C. R. Enlow (pp. 925–955); The Nutritive Value of Harvested Forages, by T. E. Woodward, W. H. Hosterman, P. V. Cardon, and E. W. McComas (pp. 956–991); Losses in Making Hay and Silage, by J. A. LeClerc (pp. 992–1016); Nutritive Value of Miscellaneous Feeds, by E. W. McComas and T. E. Woodward (pp. 1017–1026); Deficient and Excess Minerals in Forage in the United States, by A. M. Hartman (pp. 1027–1044); What Do We Need to Know in Livestock Nutrition? by O. E. Reed (pp. 1045–1064); and Composition of the Principal Feedstuffs Used for Livestock, by N. R. Ellis, W. R. Kauffman, and C. O. Miller (pp. 1065–1074), which includes tables on the percentage composition of common feeding stuffs and their digestible protein and total digestible nutrient contents as determined for cattle, sheep, and swine.

Abstracts of papers, 97th meeting, American Chemical Society (*Amer. Chem. Soc. Mtg., 97 (1939), Abs. Papers, pp. A10, 12; B3, 4, 7, 8, 9*).—*Abstracts of the following papers, dealing with subjects of significance in animal nutrition from the agricultural and food chemistry and biological chemistry sections, are noted:* Utilization of Energy of Wheat Products by Chickens, by G. S. Fraps and E. C. Carlyle (Tex. Expt. Sta.); Studies on the Partition of the Less Easily Digested Carbohydrate Complex of Feedingstuffs, by R. E. Davis and C. O. Miller (U. S. D. A.); The Xanthophylls of Olive-Colored Egg Yolks, by W. J. Peterson, J. S. Hughes, L. F. Payne, and W. M. Proudfit (Kans. State Col.); Factors Affecting the Adsorptive Power of Magnesia for Carotene, by G. S. Fraps, A. R. Kemmerer, and S. M. Greenberg (Tex. Sta.); Some Effects of Feeding Vitamin A on the Blood and Milk of Dairy Cows, by C. H. Whitnah, W. J. Peterson, H. W. Cave, and F. W. Atkeson (Kans. Sta.); Efficiency of Maize Proteins for Growth, by D. B. Jones and J. P. Divine (U. S. D. A.); and Preparation and Nutritive Value of *d*-Ribose From Whey, by C. H. Whitnah, W. J. Caulfield, and T. B. Avery (Kans. Sta.).

Dietary requirements of the guinea pig, with reference to the need for a special factor, M. D. Cannon and G. A. Emerson. (Univ. Calif.). (*Jour. Nutr., 18 (1939), No. 2, pp. 155–167*).—A highly purified diet, supplemented with all known essential dietary factors and which proved adequate for the growth

and well-being of rats, failed to support guinea pigs. The administration of abundant orange juice, riboflavin, wheat germ autolysate, crude liver extract, liver filtrate, or synthetic B complex, all failed to alleviate this deficiency. The addition to the diet of small quantities of fresh lettuce, aqueous lettuce extract, air-dried grass, or aqueous grass extract supplied a factor which permitted guinea pigs to grow normally on this diet for considerable periods. The factor was water soluble and fairly stable to heat and drying. It is apparently identical with the factor described by workers at the Wisconsin Experiment Station (E. S. R., 79, p. 667).

Vitamin B_1 in the animal organism.—III, The maximum storage of vitamin B_1 in various species, P. C. Leong (*Biochem. Jour., 33 (1939), No. 9, pp. 1394–1396*).—Adult guinea pigs, fowls, and pigeons, after receiving a high vitamin B_1 intake for from 3 to 4 weeks, were sacrificed, and certain of their tissues were assayed for vitamin B_1 content. Similar data obtained on rats at an earlier date are included. The highest concentration in muscles of the guinea pig, fowl, pigeon, and rat were 0.3, 0.3, 1.2, and 0.6 International Units per gram, respectively, and in the livers 0.7, 0.7, 1.1, and 2.6 I. U. per gram.

***Effect of soil treatment on the vitamin B_1 content of wheat and barley*, P. C. Leong** (*Biochem. Jour., 33 (1939), No. 9, pp. 1397–1399*).—Assays of wheat and barley, each produced under five different fertilizer treatments, gave evidence that the vitamin B_1 potency of these grains is not significantly influenced by soil treatment.

Digestibility of straw, R. E. Slade, S. J. Watson, and W. S. Ferguson (*Nature [London], 143 (1939), No. 3631, p. 942*).—This report from Jealott's Hill Research Station, England, indicates that the digestibility of oat and wheat straws was markedly enhanced by soaking the straws in a solution of caustic soda. Immersion in a 1.25-percent solution for from 20 to 24 hr. without heating gave most effective results. By this method the starch equivalent of oat straw was increased from 21.7 to 42.1 lb. per hundredweight and wheat straw from 13 to 32 lb. per hundredweight. After washing, the treated straw was readily eaten by ruminants. Fattening beef cattle receiving approximately two-thirds of their starch equivalent intake from such straw made satisfactory gains.

The effect of sulfur dioxide on the nutritive value of alfalfa hay, J. K. Loosli, B. L. Richards, Jr., L. A. Maynard, and L. M. Massey (*[New York] Cornell Sta. Mem. 227 (1939), pp. 39*).—In a series of experiments, samples of alfalfa hay produced in the field under natural exposure to smelter fumes and others produced experimentally in the field or greenhouse and subjected to various concentrations of SO_2 were assayed for nutritive properties by various technics. Hay grown in an area subject to smelter fumes and intermittently exposed to SO_2 when fed as a sole diet (+vitamin C) for rabbits and guinea pigs from weaning age through reproduction and lactation gave equally as good results as hay produced under similar cultural conditions outside the smelter-fume area. In digestion trials with lambs, rabbits, and guinea pigs, no significant differences were found between the normal and SO_2-exposed hays. Similar results were obtained with hays subjected to cabinet fumigation with SO_2 at various concentrates. Such fumigations increased the sulfur content (mainly inorganic) of the hays, but balance trials with rabbits indicated but little greater sulfur retention from the high-sulfur hay than from the normal. The analysis of hays for protein, fat, fiber, ash, and carotene indicated that none of the SO_2 fumigations caused chemical alterations having nutritional significance, although they did increase the sulfur content in all cases.

Sudan grass management for control of cyanide poisoning, F. T. Boyd, O. S. Aamodt, G. Bohstedt, and E. Truog. (Wis. Expt. Sta.). (*Jour. Amer.*

Soc. Agron., 30 (1938), No. 7, pp. 569–582, figs. 4).—A more comprehensive report of research previously noted (E. S. R., 82, p. 86).

Endogone as animal food, W. W. Diehl (U. S. D. A.). (*Science, 90 (1939), No. 2341, p. 442*).—This note records certain instances where the small truffle-like fructifications of *Endogone* have served as food for shrews and mice.

[Analyses of native feeding stuffs in Puerto Rico] (*Puerto Rico Sta. Rpt. 1938, p. 132*).—Investigations on the composition of the empty pods, the beans, and the entire fruit of the leguminous tree, *Gliricidia sepium*, are presented by J. O. Carrero. Each portion was analyzed at three stages of maturity. The dry mature fruit, which is readily eaten by cattle, contained approximately 9 percent of crude protein and 3 percent of ash. The dry beans were relatively very high in both crude protein and crude fat.

Inspection of commercial feeding stuffs, 1939, T. O. Smith and H. A. Davis (*New Hampshire Sta. Bul. 315 (1939), pp. 106*).—This is the usual report of the guaranteed and found analyses of 485 brands of feeding stuffs collected for inspection during the year ended June 1939 (E. S. R., 80, p. 380).

Inspection of feeds and fertilizers, W. L. Adams, T. Wright, Jr., and R. L. Swallow (*Rhode Island Sta. Feed Cir., Sept., 1939, pp. 58*).—Presented in this report are the guaranteed and found analyses of 339 samples of stock and dairy feeds and 286 samples of poultry feeds examined since the last report was compiled (E. S. R., 82, p. 229).

Beef cattle feeding investigations, W. L. Blizzard (*Oklahoma Sta. Bul. 237 (1939), pp. 18, figs. 3*).—The results of a series of beef cattle feeding trials, conducted during the period from December 1929 to April 1937, are summarized. High-grade Hereford steer calves were used in each trial.

I. *Cottonseed meal fed in varying amounts in calf fattening rations of ground shelled corn, cottonseed meal, prairie hay, and ground limestone* (4-yr. average).—It was found that approximately 1.5 lb. of 43 percent cottonseed meal per steer daily supplied an adequate amount of protein in this ration, but that the feeding of 2.5 lb. of meal improved the bloom of the finished steers. Substituting cottonseed meal for corn after the protein requirements are met proved profitable only when the meal sold for considerably less per ton than corn.

II. *The value of adding ground limestone to a calf fattening ration of ground shelled corn, cottonseed meal, and prairie hay* (2-yr. average).—The addition of 0.17 lb. of ground limestone per steer to the daily ration improved both the rate and economy of gain, but had little influence on dressing percentage or shrinkage in marketing.

III. *Substituting cottonseed meal for ground shelled corn in a fattening ration of corn, cottonseed meal, and alfalfa hay for steer calves* (1 year's results).—With alfalfa hay as a roughage, substituting cottonseed meal for corn up to one-third of the concentrate ration did not significantly influence the rate of gain, and the meal was approximately equal to corn pound for pound.

IV. *A comparison of ground shelled corn, ground threshed darso, and ground darso heads in fattening rations for steer calves* (1 year's results).—Darso in either form proved highly palatable. However, steers receiving the ground threshed darso made 12 percent less daily gain and consumed 6.7 percent more concentrates per day and those receiving the ground darso heads gained 20 percent less and consumed 9.4 percent more concentrates daily than the corn-fed steers.

V. *The value of adding silage to a fattening ration of ground shelled corn, cottonseed meal, prairie hay, and ground limestone for steer calves* (2-yr. average).—Steers fed kafir silage made slightly greater average daily gains than those

receiving no silage. One ton of the silage replaced 3 bu. of corn, 57 lb. of cottonseed meal, and 703 lb. of prairie hay under the conditions of this trial.

VI. *Cottonseed hulls compared to prairie hay as roughages in fattening rations of ground shelled corn, cottonseed meal, and ground limestone for steer calves* (5-yr. average).—With steers having free access to roughage, corn, and cottonseed meal, hay-fed steers consumed 497.6 lb. of concentrates and 184.8 lb. of hay, while hull-fed steers consumed 458 lb. of concentrates and 257.2 lb. of cottonseed hulls per 100 lb. of gain. The average daily gains were approximately the same on the two rations. Approximately 0.37 lb. more cottonseed meal was consumed daily per steer among those fed hulls than among those fed hay.

VII. *A comparison of four different roughages in fattening rations for steer calves* (2-yr. average).—Steers receiving a concentrate ration of ground corn and cottonseed cake and fed prairie hay, alfalfa hay, cottonseed hulls, or kafir silage as roughages made average daily gains of 2.44, 2.49, 2.26, and 2.28 lb. per head daily, respectively. The consumption of concentrates and roughage per 100 lb. of gain were 525.4 and 131.1 lb. on prairie hay, 491.6 and 144 on alfalfa, 490.3 and 239.3 on hulls, and 530.7 and 343 lb. on kafir silage.

VIII. *A comparison of four different roughages in wintering rations for steer calves being fed to gain 1.5 lb. per head per day* (3-yr. average).—Allowing steers a full feed of roughage but limiting the concentrate feeding to permit a gain of about 1.5 lb. per head daily, the consumption of concentrates and roughage per 100 lb. of gain were 374.3 and 536.5 lb. on prairie hay, 221.8 and 649.4 on alfalfa hay, 301.3 and 807.4 on cottonseed hulls, and 224.2 and 1,760 lb. on kafir silage.

Cottonseed meal and cake for finishing mature steers on pasture, R. H. Means (*Mississippi Sta. Bul. 329 (1939), pp. 10, figs. 3*).—A reprint, with illustrations, of a report previously noted (E. S. R., 81, p. 825).

Fall versus spring calving, R. H. Means (*Mississippi Sta. Bul. 328 (1939), pp. 14, figs. 5*).—A reprint of a report previously noted (E. S. R., 81, p. 826).

Investigations on chilled beef.—I, Microbial contamination acquired in the meatworks, W. A. Empey and W. J. Scott (*Austral. Council Sci. and Indus. Res. Bul. 126 (1939), pp. 71, figs. 8*).—The nature, extent, and sources of microbial contamination of beef during its preparation were investigated in several meat-exporting works in Australia. The spoilage of chilled beef held at temperatures around −1° C. was due to the proliferation on the beef surface of various bacteria, yeasts, and molds. Of the organisms acquired by beef surfaces in the initial contamination, less than 1 percent of those viable at 20° remained viable at −1°. The percentages of yeasts and molds in the −1° population were greater than the respective percentages in the 20° population. Of the organisms viable at −1°, four principal bacterial genera, five genera of yeasts, and six genera of molds were prominently represented, with *Achromobacter* bacteria, *Geotrichoides* and *Candida* yeasts, and *Penicillium* molds of greatest importance. The hide and hair of the slaughtered animals were the chief sources of superficial beef contamination. The microflora of beef surfaces was, in general, similar to that of the hides, which, in turn, was dependent on the microflora of the soils from the pastures on which the cattle grazed. Statistical treatment of the data indicated that the percentage incidences of organisms viable at −1° decreased during summer and also decreased with decreasing geographical latitude from which the cattle originated. Both the seasonal and geographical variations were due to a negative regression of low-temperature type organisms against temperature. By the introduction of hygienic methods into plants, as described, the extent of contamination of dressed beef was reduced to approximately 5 percent of its former level.

deficiency symptoms on the control ration were cured by adding 1 or 2 percent of cod-liver oil to the ration. No clinical symptoms of rickets occurred in the control group, but post-mortem tests revealed significantly lower bone ash content for them than for the cod-liver oil pigs.

The salt requirement of growing pigs, R. D. SINCLAIR (*Sci. Agr.*, *20* (*1939*), *No. 2*, *pp. 109–119*, *fig. 1*).—In a series of experiments at the University of Alberta, pigs receiving a ration consisting solely of a cereal mixture developed symptoms of salt craving and became very unthrifty in appearance. The addition of common salt to such a ration led to improvement in rate of growth, increased efficiency of feed utilization, and better general thrift in the pigs. When the pigs received the cereal mixture supplemented with protein concentrate and ground limestone, the addition of salt to the supplemented ration did not result in a significant increase either in rate of gain or efficiency of feed utilization. Based on chlorine balance trials, it was estimated that the daily sodium chloride requirement of a pig gaining approximately 1 lb. daily in weight is approximately 1.33 gm. The above supplemented ration without additional salt supplied an intake of 1.7 gm. of sodium chloride daily, explaining the lack of response to added salt in the ration. Feeding up to 3 percent salt in the ration led to a marked increase in water consumption and excessive urination but did not give rise to extensive retention of moisture in the muscle tissue nor cause a significant change in size or gross appearance of the kidneys.

Analysis of post-weaning growth in pigs, A. D. BUCHANAN SMITH and H. P. DONALD (*Jour. Agr. Sci.* [*England*], *29* (*1939*), *No. 2*, *pp. 274–294*, *figs. 3*).—In a study at the Institute of Animal Genetics, Edinburgh, an analysis was made of the postweaning growth records of 135 litters of pigs of the Large White breed, all weaned at 8 weeks of age and reared under uniform conditions. Weight increases occurring during three periods of 28 days each were determined, the beginning of the periods being defined (1) by age, the periods starting at 10, 14, and 18 weeks, and (2) by weight, the periods starting at 40, 80, and 120 lb.

When the periods were defined by age, the mean increase per pig was affected by weaning weight but not by litter size. The distribution of the individual weights became increasingly skew with age, indicating that while absolute rate of growth is increasing, initially small pigs fall farther and farther behind. The correlations between the average litter increases in different periods for litters ranging in size from 6 to 11 pigs are indicated. The correlations between periods 1 and 2 averaged lower than those between periods 2 and 3. Furthermore, the correlations of the total increase during all three periods with those during the second and third periods were scarcely affected by removing the effect of the increase in period 1, suggesting that a more reliable test would be obtained by considering only growth after 14 weeks of age.

When the periods were defined by weight, differences between litters in amount of gain during a test period were significant in each of the three periods. No effect of weaning weight on subsequent growth was observed in the periods defined by initial weight. The correlations between the average litter increases for the second and third periods were slightly higher for periods defined by age than corresponding values of those defined by weight, but none exceeded 0.5. This suggested that careful control of environment in testing stations is necessary for reliable litter testing, and that the results from these stations should be examined for evidence of genetic differences in rate of growth during restricted portions of the total test period (E. S. R., 78, p. 839).

The nutrition of the bacon pig, III, IV (*Jour. Agr. Sci.* [*England*], *29* (*1939*), *Nos. 1*, *pp. 115–130*; *4*, *pp. 502–525*).—This series of experiments has been continued (E. S. R., 78, p. 840).

as a basis of comparison between this native stock and American and foreign horses.

Vitamin A deficiency in the dog.—I, Experimental production of the vitamin A deficient conditions, W. C. Russell and M. L. Morris. (N. J. Expt. Stas.). (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. 750, pp. 316–320, figs. 4*).—Two young dogs (litter mates) maintained on a vitamin A-deficient diet developed pronounced symptoms of vitamin A deficiency in 45 and 47 days. These dogs did not respond immediately to vitamin A supplementation, but after 14 and 6 days, respectively, of carotene feeding growth was resumed and continued to the end of the experiment. Both animals presented an abnormal blood picture. Low hemoglobin content and low red blood cell count were not due to a lack of vitamin A, and it was not possible to determine whether the total white and differential blood picture was due to infection or vitamin A deficiency.

Federal poultry research at the Agricultural Research Center, Beltsville, Md., J. R. Mohler (*U. S. Dept. Agr., Misc. Pub. 368 (1939), pp. 32, figs. 31*).—In addition to a brief discussion of the facilities and equipment available for research and a report on the National Poultry Improvement Plan, brief progress results are presented for the various lines of investigation being conducted in the fields of poultry breeding, physiology of development and reproduction, nutrition and physiology of nutrition, poultry meat and egg quality, and parasites and diseases.

Commercial poultry farming, T. B. Charles and H. O. Stuart (*Danville, Ill.: Interstate Ptg. Co., [1939], 3. ed., pp. XIV+496, figs. 200*).—This is the third edition of this well-known book (E. S. R., 77, p. 683).

The respiratory system of the chicken, W. M. McLeod and R. P. Wagers. (Kans. State Col.). (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. 448, pp. 59–70, figs. 12*).—A comprehensive general discussion.

Observations on the natural food of the young chick of the domestic fowl, A. Brownlee (*Vet. Jour., 95 (1939), No. 10, pp. 394–404*).—In the study reported, 13 chicks, having access only to natural foodstuffs, were sacrificed at ages ranging from 2 to 36 days. The crops and gizzards were then examined for the types of food material consumed. The weight ratio of animal : vegetable material present ranged from 806 : 1 to 0.08 : 1, indicating that the type of food consumed was governed largely by availability. Grass blades and other leaves were rarely eaten by these young chicks. Differences in the type of material present in the crop and gizzard indicated that animal food was more easily digested than vegetable.

A compilation of experimental information on feeding laying hens, H. O. West (*Mississippi Sta. Bul. 330 (1939), pp. 52*).—This compilation includes a general discussion of the feed requirements of laying hens, followed by experimental information on proteins; vitamins; mineral supplements; mash, grain, etc., in rations for laying hens; use of lights in winter; range v. clean yard; effect of age on laying ability; and feed consumption by the various breeds.

The use of high-protein laying mashes, J. A. Davidson (*Michigan Sta. Quart. Bul., 22 (1939), No. 2, pp. 87–91*).—Results are presented for two trials, one with White Leghorns and the other with Rhode Island Red pullets, in which 18- and 30-percent protein mashes as supplements to home-grown grains were compared over a 10-mo. laying period. In each trial the consumption of mash was less and the total amount of grain consumed was greater with the high-protein mash. Egg production was less for the former breed but greater for the latter breed on the high-protein mash. Certain problems encountered

:he high-protein mash, particularly with reference to supplying ade-
nts of vitamins and minerals, are discussed.

tenoid pigments, W. J. PETERSON, J. S. HUGHES, and L. F. PAYNE *a. Tech. Bul. 46 (1939), pp. 74, figs. 6)*.—A comprehensive review of oid pigments dealing with the occurrence, properties, and methods of on of this class of compounds, with special reference to their utiliza- hen, is presented. Some previously unpublished data from various are included, along with the review of published literature. The ter is grouped under the following general headings: The carotenoid he separation and quantitative determination of the carotenoids, of carotenoid pigments in the hen, the carotenoid pigments of feeds, f gene dosage on carotenoid pigments in maize, the relation of the pigments of feed to the carotenoid pigments of egg yolk, the vitamin of cryptoxanthol (cryptoxanthin) with some observations on the curves of the petroleum-phasic fraction of feedstuffs, the petroleum- tenoids of egg yolk, the vitamin A potency of the petroleum-soluble eggs, and olive-colored yolks.

aphy of 164 references is included.

phalomalacia activity of dl-α-tocopherol, H. DAM, J. GLAVIND, and E. HAGENS *(Nature [London], 142 (1938), No. 3609, pp. 1157.* s brief report from the University of København (Copenhagen) at the administration of synthetic *dl*-α-tocopherol to chicks at the 75 mg. per gram of body weight daily completely protected them ritionally induced encephalomalacia. It is suggested that it should to standardize vitamin E in fats by means of the antiencephalo- ivity.

f wheat germ oil to prevent lymphomatosis in chickens, L. W. K. B. DEOME. (Univ. Calif.) *(Jour. Amer. Vet. Med. Assoc., 'o. 448, pp. 73–76)*.—Two comparable lots of chicks were reared on tions, except that for one group 0.25 part of wheat germ oil was e mash while the control group received no wheat germ oil. The ice and also the type of lymphomatosis occurring in each group to ge indicated that the feeding of wheat germ oil had no appreciable incidence, type, or age of onset of this disorder in chicks.

roduction, H. O. WEST *(Mississippi Sta. Bul. 335 (1939), pp. 76,* This extensive compilation includes information on the following he broiler business: Is broiler production profitable, securing baby ding and brooding, feeding, marketing, and diseases and parasites.

omy, physiology, and pathology of the egg, M. A. C. STIDSTON *Agr. So. Austral., 42 (1939), No. 12, pp. 1045–1051; 43 (1939), Nos. 1, 1; 3, pp. 202–208)*.—This series of papers presents a comprehensive he characteristics of the normal egg and defects of the egg which it unsuitable for trade.

ic potentials of the hen's egg, A. L. ROMANOFF and C. L. COTTRELL iv.). *(Science, 90 (1939), No. 2342, pp. 471, 472, fig. 1)*.—Employing circuit, as described, the electrical potential difference of hen's eggs ined by applying a pair of physiological saline solution capillary the opened egg, one electrode touching the albumen some distance lk while the other electrode was placed on the top of the yolk. ectrode in contact with the center of the blastoderm, fresh infertile a difference in potential of about 0.2 mv., and fresh fertile eggs . These values progressively increased with eggs at 8-, 12-, 16-, and

24-hr. stages of incubation. On the same egg the differences decreased as the contact was moved away from the center of the blastoderm.

Effect of temperature on size of eggs from pullets in different latitudes, D. C. Warren. (Kans. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *59* (*1939*), *No. 6, pp. 441–452, figs. 8*).—Data on egg size secured at 11 different locations ranging from the Philippine Islands (lat. 14° N.) to Scotland (lat. 56° N.) were analyzed in this study. Curves are presented showing mean daily egg weights, together with the daily maximum temperature for each locality for the pullet laying year. It is evident that temperature was a very important factor in determining the shape of these curves. In general, egg size increased rapidly during the first few months as birds approached physiological maturity, but beyond this stage egg size was found to bear a close relationship to the temperature prevailing. Excessively low temperature had little effect on egg size, and where the maximum temperature seldom exceeded 70° F. egg size tended to increase throughout the pullet laying year, with a relatively slow rate of increase during the last half of the year. However, when the daily maximum temperature exceeded 70° for a few days, egg size fluctuations usually showed a close correlation with temperature variations. High average summer temperature resulted in greatly depressed summer egg size, with birds failing to express their maximum potentialities for egg size until the temperature dropped below 70°. With declining temperature egg size increased rapidly, indicating that the summer decline was not the result of any fatiguing effect of a long period of production.

The formation of the egg in the oviduct of the turkey (Meleagris gallopavo), V. S. Asmundson. (Univ. Calif.). (*Jour. Expt. Zool., 82* (*1939*), *No. 2, pp. 287–304, figs. 2*).—The findings set forth in this report are based on a comparison of the weight and composition of laid eggs with similar data obtained on eggs removed from the posterior part of the magnum, the isthmus, and the uterus of turkey hens. It appeared that all of the protein in the albumen of the eggs was secreted in the magnum and that the shell membrane was secreted in the isthmus. The turkey eggs had a relatively heavier shell membrane than chicken eggs. The albumen of an egg entering the uterus weighed about 50 percent or more of that in a laid egg. A small amount of water was added to the albumen in the isthmus, the balance being added in the uterus. The differentiation of albumen into layers generally began in the uterus, although sometimes at an earlier stage. The secretion of the shell began immediately when the egg entered the uterus. Eggs removed from the isthmus had the smaller, more pointed end caudad, indicating that the shape was determined before the egg reached the uterus. The relation of the length of various parts of the oviduct to its entire length is indicated for both turkeys and chickens.

Feeding and confinement rearing experiment with turkeys during 1938 (fourth report), F. N. Barrett, C. G. Card, and A. Berridge (*Michigan Sta. Quart. Bul., 22* (*1939*), *No. 2, pp. 79–87*).—The fourth report in this series (E. S. R., 80, p. 531) presents the results of experimental feeding trials involving 10 pens of poults hatched in late April and early May. The inclusion of green feed, as alfalfa, lawngrass, or green oats, in the ration of some of the groups had little apparent influence on the rate of growth, feathering, or other features of development, but did result in a slight saving in total feed cost in some instances. Eight of the pens received a 27.5-percent protein mash throughout the feeding period, while two of the pens were changed to a 31-percent protein mash at 8 or 10 weeks of age. This change resulted in a lower mash consumption. The practice appeared to be satisfactory, although results are preliminary rather than conclusive. Three pens had free choice of corn, wheat, oats, and

e birds consumed more pounds of oats than any other single grain tance. Wheat ranked second in this respect, while corn was eaten fferently by birds in two of the pens, and barley was eaten very ı all cases. Other results tended to substantiate earlier findings.

DAIRY FARMING—DAIRYING

;ations in Texas with dairy cattle and dairy products] (*Texas Sta. ıp. 93–95, 130*).—Included are brief progress reports of studies on the e requirements of vitamin A for dairy cattle, by O. C. Copeland and ; the value of dried citrus peel and pulp in the ration of milking opeland and C. N. Shepardson; the value of bonemeal and lime in of heifers and milking cows, by P. R. Johnson; cottonseed meal and ration for lactating cows, by Copeland; and factors affecting the southern short-cure cheese, and methods of manufacture and other cting the quality of butter, both by F. E. Hanson and Shepardson.

dairy calves and heifers, H. O. Henderson and G. Heebink (*West a. Cir. 76 (1939), pp. 24, figs. 7*).—Practical suggestions are offered the care of the cow before and at calving time, care of the newborn ıg and management of calves, the raising of dairy heifers from eshening age, common calf ailments, and the fitting and showing of animals.

nation of a dairy type in native carabaos, with a preliminary hysical measurements, T. V. Rigor (*Philippine Jour. Anim. Indus.,). 3, pp. 277–282*).—Data are presented on the external body measure-9 carabao cows, with an indication of the extent of correlation ween the various measurements.

son of methods used for detecting the enzyme phosphatase in ucts, W. H. Brown. (Ind. Expt. Sta.). (*Jour. Bact., 38 (1939), No. 596*).—A comparison of the various methods indicated that the Kay m, Gilcreas and Davis, and Scharer technics are nearly equal in ın of inadequately pasteurized dairy products. Cream was found greater amount of the enzyme phosphatase than milk, so that if the r properly pasteurized milk is to be applied to cream the time and of pasteurization must be proportionally increased. Butter made rly pasteurized cream and allowed to stand without refrigeration ays gave a positive phosphatase test.

ction in mixtures of raw and pasteurized homogenized milk, and G. M. Trout (*Michigan Sta. Quart. Bul., 22 (1939), No. 2, pp. . 1*).—Studies were conducted to determine if and to what extent f raw homogenized milk would exert its action on similar milk un-l. In one trial, homogenized raw milk was mixed with homogenized milk in varying proportions. The increases in the titratable acidity xtures after storage were greater than the calculated values if only duct had undergone lipolysis, indicating that the fat in the pasteurized also being split to some extent by the lipase action. In a second genized raw milk was mixed with unhomogenized pasteurized milk, ts were obtained by churning the mixtures after 0, 48, and 96 hr. of esumably this method should yield fat only from the unhomogenized he mixture. Titration of the pure fat obtained after storage indicated undergone appreciable lipolysis, with evidence that the fat had come he homogenized and unhomogenized portions of the milk.

ions on cooked flavor in milk: Its source and significance, D. V. and F. J. Doan. (Pa. Expt. Sta.). (*Milk Dealer, 29 (1939), No. 2,*

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pp. 35, 36, 54, 56, 58–60, 62).—A series of tests to determine the effect of heating whole milk and various milk products on the flavor, sulfhydryl content, oxidation-reduction potential, and ascorbic acid content led to the following conclusions: Heating milk, cream, skim milk, and certain other milk products to a sufficiently high temperature or holding them at lower temperature for a sufficient period of time results in the formation of sulfhydryl compounds from one or more of the proteins present. These sulfhydryl compounds appear to be wholly responsible for the cooked flavor of heated milk and milk products and also for the decrease in the oxidation-reduction potential of heated dairy products. They also are active antioxidants and are apparently responsible for the inhibition of tallowy or oxidized flavor in milk heated to temperatures over 170° F. On oxidation, the sulfhydryls lose their flavor characteristic. Most heated milk products do not become tallowy until the sulfhydryls are first oxidized and the cooked flavor has disappeared. The sulfhydryl compounds also act as antioxidants toward ascorbic acid. Lactalbumin of milk is considered the most likely source of these compounds, with the protein of the fat globule membrane as a possible additional source.

Dye concentration in culture media employed for the analysis of Escherichia-Aerobacter members in milk, H. D. McAuliffe and M. A. Farrell. (Pa. Expt. Sta.). (*Amer. Jour. Pub. Health, 28 (1938), No. 10, pp. 1217–1221, fig. 1*).—Continuing this line of investigation (E. S. R., 77, p. 386), it was found that small portions of milk added to fuchsin lactose broth and brilliant green lactose bile broth 2 percent adsorbed a considerable amount of the dyes present, thereby lessening the selective action of these media in the detection of the *Escherichia-Aerobacter* group of organisms in milk. To obtain the proper amount of free dye in these culture media for optimum selective capacity with milk it appeared to be necessary to increase the content of basic fuchsin in the former medium approximately 7 times that used in standard methods of water analysis, or to 1 part in 9,500, and the content of brilliant green dye in the latter medium by approximately 2½ times, or to 1 part in 30,000.

The sanitary status of the paper milk bottle, J. R. Sanborn and R. S. Breed. (N. Y. State Expt. Sta.). (*Milk Plant Mo., 28 (1939), No. 5, pp. 24–27, fig. 1*).—This is a reprint of work previously noted (E. S. R., 81, p. 865).

The influence of neutralizers upon the acidity of butter and butterfat, I. A. Gould and R. C. Townley (*Michigan Sta. Quart. Bul., 22 (1939), No. 2, pp. 96–101, fig. 1*).—In the trials described, lots of cream testing approximately 35 percent fat and 0.5 percent acidity were neutralized to acidities of 0.25, 0.15, 0.1, 0.05, and 0 percent with each of six neutralizers. The creams were then pasteurized and churned by standard methods, and the acidities in the resulting butterfats and butters determined. The average corresponding values for the butter were 0.122, 0.111, 0.098, 0.087, and 0.069, respectively, and of the butterfats 0.94, 0.082, 0.072, 0.061, and 0.047, respectively. The neutralizers were not equally effective in lowering the acidities of the butter and butterfat, the limes being less efficient than the soda neutralizers. While the acidity of the butterfat averaged lower than that of the corresponding butter, the differences varied with the type and amount of neutralizer used.

Bacteriology of butter.—VII, Effect of reworking butter on growth of bacteria, H. F. Long and B. W. Hammer (*Iowa Sta. Res. Bul. 263 (1939), pp. 185–200, figs. 8*).—Continuing this series of studies (E. S. R., 80, p. 817), unsalted butter made from pasteurized cream inoculated with various organisms was held at approximately 10° C. and reworked at various intervals ranging from 1 to 7 days. As a result of reworking, the growth rates of bacteria frequently were increased and the time required for the development of defects commonly was

In butter from cream to which butter culture had been added the of the butter serum decreased more rapidly, and in that from cream ipolytic organisms had been added the acidities of the fat increased lly after reworking. It is concluded that reworking butter may accel-ous microbiological changes in the product, due primarily to the dis-of organisms to previously uninfected moisture droplets and providing food supply for certain of the organisms by aggregating the moisture. ed effect of certain types of butter-printing equipment in aggregating ire of butter is discussed.

aking of processed cheese, H. H. Sommer and H. L. Templeton *n Sta. Res. Bul. 137 (1939), pp. 31, figs. 5)*.—This bulletin presents a mé of the historical developments in the processed cheese industry and controlling various processes and equipment used in the industry. *nt status of these patents is summarized, and the more important* be considered if one were to go into the business of processing cheese ed.

ium on the industrial utilization of dairy products (*Amer. Chem. 97 (1939), Abs. Papers, pp. A4–7*).—Abstracts of the following papers : Industrial Products of the Dairy Industry, by G. E. Holm, Casein E. O. Whittier and S. P. Gould, Whey Products in Foods, by B. H. Webb D. A.) ; Whey as a Source of Vitamins and Vitamin Products, by G. C. The Separation of the Constituents of Whey, by A. Leviton (U. S. D. A.) ; of Lactic Acid From Whey, by S. M. Weisberg; Casein Plastics, by ber, and Utilization of Lactic Acid, by L. T. Smith and H. V. Claborn S. D. A.).

VETERINARY MEDICINE

in animal pathology and parasitology by the Texas Station] (*Texas 1938, pp. 12, 13, 14, 33, 215–217, 217–220, 223*).—The work of the year 81, p. 104) briefly reported upon relates to anaplasmosis in cattle, Piercy; infectious bovine abortion, by H. Schmidt, R. D. Turk, O. C. and C. N. Shepardson; poisonous plants (including red-stemmed pea *agalus emoryanus*), sacahuista, *Sartwellia flaveriae, Drymaria pachy-* d photosensitization from Sudan grass) in the Davis Mountains immies in sheep and goats, both by F. P. Mathews (coop. U. S. D. A.) ; sistance in animals, by B. L. Warwick, Schmidt, Turk, and R. O. the Sonora Substation, hard yellow livers of sheep and cattle, con-ecthyma (soremouth) of sheep and goats, stomach worms (*Hae-contortus*) in sheep and goats, infectious enterotoxemia of lambs and l feeding trials of suspected plants, all by I. B. Boughton and W. T.

reed, a poisonous plant of west Texas, I. B. Boughton. (Tex.). (*Southwest. Sheep and Goat Raiser, 10 (1939), No. 3, p. 88*).—sts conducted in connection with investigations of outbreaks of stiff-g range sheep in west Texas showed conclusively that the common l (*Helenium microcephalum*) is rapidly fatal to both sheep and e severity of symptoms and sickness induced seems to depend on the sneezeweed eaten. Doses of from ¼ to ½ lb. of the mature plant kness and death within 1 or 2 hr. in from 75- to 100-lb. sheep, while nounts induced a severe, protracted illness which was not always ts in which small daily doses of from ½ to 1 oz. were fed demon-at the poisoning is cumulative, the animal showing symptoms several

days or weeks after the test was started. This plant is said to be common to the sheep and goat country of west Texas, where it is found growing along stream beds and in pastures around old lake beds or small depressions where the water collects and the ground remains fairly moist. Notes on the symptoms resulting, post-mortem findings, and treatment are included.

The retention and excretion of selenium after the administration of sodium selenite to white rats, R. A. Gortner, Jr., and H. B. Lewis (*Jour. Pharmacol. and Expt. Ther., 67 (1939), No. 3, pp. 358–364*).—In the investigation reported young rats were fed synthetic diets containing sodium selenite at levels of 25, 35, and 50 p. p. m. of selenium. "The selenium content of the combined liver, kidneys, and spleen of individual rats fed sodium selenite over prolonged periods ranged from 0.03 to 0.17 mg., or from 0.4 to 2.8 percent of the selenium ingested. No correlation between the selenium concentration of the diet and that of the organs could be demonstrated. Ingested selenium appeared to be rapidly eliminated by the organism of the rat. From 20 to 50 percent of orally ingested selenium was excreted in the feces. No relation between the selenium content of the feces and the concentration of selenium in the diets could be demonstrated. It is believed that the greater part of the fecal selenium originates from dietary selenium which has escaped absorption."

Sodium chlorate poisoning, E. C. McCulloch and H. K. Murer. (Wash. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. 753, pp. 675–682*).—A review of the literature and experiments conducted by the authors are reported upon. The lethal oral dose of sodium chlorate for young chickens seemed to be slightly greater than 5 mg. per gram of body weight and for sheep between 2.06 and 2.5 mg. Sheep weighing between 90 and 100 lb. survive 90 gm. but succumb following the administration of 120 gm. "Somnolence and dyspnea are constant symptoms, and doses as small as 10 gm. produce detectable amounts of methemoglobin in the blood of sheep. Marked darkening of the blood, muscles, and viscera due to the presence of methemoglobin, together with deep, black erosions in the lining of the abomasum and upper part of the duodenum, are the characteristic pathological changes found in acute fatal cases. Neither the administration of reducing agents nor the alkalization of the digestive tract with copious amounts of sodium carbonate solution, 2 hr. after the sodium chlorate, prolonged the life of sheep fed sodium chlorate. No successful antidote for sodium chlorate poisoning in sheep has been found. Bindweed sprayed with 5 lb. of sodium chlorate per square rod did not prove toxic to a sheep fed no other food over a period of 11 days."

An experimental study of the relation between concentration of disinfectants and time required for disinfection, F. W. Tilley. (U. S. D. A.). (*Jour. Bact., 38 (1939), No. 5, pp. 499–510, figs. 5*).—The author has determined the bactericidal efficiencies of several phenols and alcohols by a modified Rideal-Walker technic, and from the experimental data thus obtained has calculated values of the concentration exponent for these disinfectants. Details of the findings are given in charts and tables. The bactericidal efficiencies of the following were tested against *Staphylococcus aureus* and *Eberthella typhosa*: Phenol, *o*-cresol, *p*-cresol, *o*-butyl phenol, *p*-butyl phenol, resorcinol, *n*-propyl resorcinol, ethyl alcohol, and *n*-butyl alcohol.

The relationship between temperature and the streptococcidal activity of sulfanilamide and sulfapyridine in vitro, H. J. White (*Jour. Bact., 38 (1939), No. 5, pp. 549–562, figs. 2*).—The report presented deals with data bearing on quantitative relationships between drug and bacteria, in terms of bactericidal action, at various temperatures between 30° and 39° C. A list of 20 references to the literature is included.

scopic diagnosis of parasitism in domestic animals (*Illinois Sta. Cir.* ?), *pp. 123, figs. 151*).—This replaces Circular 401 (E. S. R., 69, p. 105). nore complete account, with additional photographs of specimens and s of the life cycles of representative classes of parasites.

nemia: Observations on clinical and nonclinical cases, J. F. BULLARD. pt. Sta.). (*Cornell Vet., 29 (1939), No. 4, pp. 377–383*).

llosis in man and animals, I. F. HUDDLESON ET AL. (*New York: Com-th Fund; London: Oxford Univ. Press, 1939, [rev.], pp. XXI+339, , figs. [18]*).—A revision of the earlier work (E. S. R., 72, p. 382) by the nd his associates, namely, A. V. Hardy, J. E. Debono, and W. Giltner, e attempted to include the latest findings on this disease. A list of 378 ›s to the literature is included.

ly of the protein-nucleates of the species of the genus Brucella.—ical constitution of the protein-nucleates. II, Biological properties protein-nucleates, W. H. STAHL, R. B. PENNELL, and I. F. HUDDLESON n *Sta. Tech. Bul. 168 (1939), pp. 22*).—Studies of the chemical constitu-. 3–14) and of the biological properties (pp. 14–19) of the protein ; are reported. A description is given of methods for preparing protein nucleate and separating it into its components, protein and acid. "The protein nucleate comprises approximately 14 percent of dry weight of the cells in the case of the preparations from smooth and about 18 percent of the intermediate-rough and rough strains. ein component comprises about 70 to 75 percent of the protein nucleate from the smooth strains and about 60 percent of those prepared from rmediate-rough and rough strain. The nitrogen partition is given. ins contain traces of sugars but no amino sugar. Guanine, adenine, sine, but no thymine and uracil, were found in the nucleic acids. Both and desoxypentose sugars were present and studied quantitatively. ıs a soluble and insoluble portion when mixed with an excess of glacial :id, and further data tend to show that there are two nucleic acids The other alternative, a nucleic acid composed of both pentose and ntose nucleotides is possible but improbable. The results of precipita-dies with the protein nucleates and protein components from smooth reparations show that they are not type-specific and that the nucleic sesses no precipitating power. The protein nucleate and protein com-'rom the intermediate-rough and rough strain reacted only slightly nologous and heterologous antiserum. Their nucleic acids also pos-o precipitating power. The protein nucleate and protein component ıtype-specific reactions in *Brucella*-sensitized rabbits. The IR and R eparations elicit only a slight allergic reaction. The protein nucleate, and nucleic acid were found to be nontoxic."

is given of 28 references to the literature.

:ion of contamination of raw market milk with Brucella abortus, RCH and L. M. BISHOP. (Minn. Expt. Sta.). (*Cornell Vet., 29 (1939),* . *410–415*).—A description is given of a method which, although it will :t all infected herds if applied routinely, would be effective in detecting nples coming from badly infected herds.

reparation and purification of Brucella antiserum, I. F. HUDDLESON :. PENNELL. (Mich. Expt. Sta.). (*Science, 90 (1939), No. 2346, pp. 571,* eport is made of several procedures examined with a view to obtaining *la* antiserum of high precipitin titer or neutralizing power and as free ble from nonspecific substance for therapeutic application in certain human brucellosis. Of the six procedures examined for the concentra-

tion and purification of the antiserum, a combination of two—a description of which is given—alone proved of value.

Effect of sulfapyridine (Dagenan) on Brucella abortus in vitro and in vivo, E. E. Hamann and I. F. Huddleson. (Mich. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc., 42 (1939), No. 2, pp. 555, 556*).—Experiments conducted in vitro and in vivo are reported. The administration of sulfapyridine by mouth in large amounts over a period of 10 days was found to have little, if any, effect on the course of *B. abortus*.

Studies on experimental Cochliomyia americana infestations, with special reference to the bacterial flora and the development of immunity, F. A. Borgstrom (*Amer. Jour. Trop. Med., 18 (1938), No. 4, pp. 395–411*).—The investigation conducted has demonstrated the development of an immunity to the effects of reinfestations by screwworm larvae. This was made evident by the fact that animals reinfested after a 20-day interval were able to survive the injurious effects of a dose of larvae which proved lethal to a normal guinea pig within 5 days. There was a reduction in the number of larvae that succeeded in establishing themselves when placed in a previously infested animal, but larvae present in the wound 24 hr. later grew and developed in a normal manner. It was found that the exudate from the screwworm lesions has immunizing properties. Animals wounded and smeared with exudate from infested lesions for 5 days showed the same ability as previously infested animals to survive a normal lethal dose of larvae after a 20-day interval. It has been demonstrated that this immunity is not due to acquired resistance to the accompanying bacteria. The immunity to the screwworm is confined to the area infested, as animals reinfested after 20 days on the opposite shoulder were unable to survive a normal lethal dose of larvae. A gram-negative bacillus has been found to be invariably associated with the screwworm lesions. This organism does not conform to any hitherto described species. It is herein described and named *Proteus chandleri*.

The influence of disulfanilamide on experimental influenza infections, D. R. Climenko, M. L. Crossley, and E. H. Northey (*Jour. Pharmacol. and Expt. Ther., 67 (1939), No. 2, pp. 201–211*).—The studies reported include an extension of earlier investigations, together with a description of some of the pharmacological and toxicological properties of disulfanilamide. Sodium disulfanilamide was found to exert a protective action against moderate infecting doses of influenza virus. This drug is capable of inactivating influenza virus in vitro. It is absorbed from the gastrointestinal tract and excreted by the kidney, such excretion being extremely rapid. It has a very low toxicity.

Effect of thiamin chloride on Eimeria nieschulzi infection of the rat, E. R. Becker. (Iowa State Col.). (*Soc. Expt. Biol. and Med. Proc., 42 (1939), No. 2, pp. 597, 598*).—Experiments reported indicate that vitamin B_1 (thiamin chloride) exerts a restraining influence on the development of *E. nieschulzi* in its rat host.

Foot-and-mouth disease: Vaccination experiments (1938–39) carried out at the Danish Experimental Station, Lindholm, E. F. Fogedby (*Vet. Rec., 51 (1939), No. 44, pp. 1307–1309*).—An account is given of the course of experimental work which led to the production of the innocuous and effective vaccine for foot-and-mouth disease. The two forms produced for use against this disease are known, respectively, as the Riems vaccine and the Lindholm vaccine. There is no essential difference between these vaccines, both being based on the principle advanced by S. Schmidt, namely, adsorption of virus on aluminum hydroxide followed by attenuation by certain chemical and physical means. The Riems vaccine is attenuated with formalin and heat-treated at 25° C. for 48 hr., while the Lindholm vaccine is attenuated by heating at 37° for 72 hr.

rimental work with Mycobacterium paratuberculosis and M. R. GRAHAM, L. E. BOLEY, and N. D. LEVINE. (Univ. Ill.). (*Cornell (1939), No. 4, pp. 352–362*).—This contribution is presented in three

te on the efficacy of chaulmoogra oil in the treatment of bovine parasis (pp. 352–356).—In tests in which chaulmoogra oil was fed to 61 t reacted positively to the paratuberculosis test, the treatment had no the results of subsequent paratuberculosis tests as compared with a group. No clinical manifestations of the disease were observed in or nonreacting animals.

effect of chaulmoogra oil and related substances upon the growth acterium avium in vitro (pp. 357–359).—In the experiments reported ors found chaulmoogra oil in a concentration of 1–100 to inhibit the f but not to kill *M. avium* in vitro. "In a concentration of 1–500 it growth in two of six flasks inoculated. In higher dilutions no apparon the growth of *M. avium* was noted. The sodium salts of the total *Hydnocarpus wightiana* in concentrations of from 1–100 to 1–1,000 inne growth of but did not kill *M. avium* in vitro. In higher dilutions ent effect on the growth of *M. avium* was noted. Sodium di-*n*-heptyl n concentrations of from 1–100 to 1–1,000 inhibited the growth of but kill *M. avium* in vitro. In a concentration of 1–2,000 the inhibitory s less marked, and in concentrations of 1–4,000 and 1–8,000 no appreect was noted."

perimental treatment of Johne's disease with avian tuberculin (pp. —The authors found in experiments with seven cows affected with lisease and one suspected of being infected, as judged by their temreactions after the injection of avian tuberculin, treated by one, two, series of subcutaneous injections that there was no appreciable effect sults of subsequent tests.

olic studies of a non-hemolytic Streptococcus, J. W. KING, J. C. nd M. A. FARRELL. (Pa. Expt. Sta.). (*Jour. Bact., 37 (1939), No. [-580]*).—Through use of a photoelectric colorimeter as a means of estie turbidity produced by the growth of *S. rheumaticus*, it was found that oamino, monocarboxylic acid fraction of a casein acid hydrolyzate does ort growth, and that the proline fraction inhibits growth, while the ohol insoluble fraction and the unfractionated hydrolyzate stimulates The inhibitory action of the proline fraction, even in low concentras shown to affect the growth of this streptococcus. Such inhibition caused by the amino acids, proline or hydroxyproline. A study of the ids known to be present in the butyl alcohol insoluble fraction showed nine, histidine, and glutamic acid, in the order named, stimulated the f this organism. Lysine and aspartic acid had little appreciable effect tophan an inhibitory effect on its growth. A few monoamino, monoc amino acids were studied. Alanine, valine, and to a lesser extent and methionine, stimulated the growth of this organism."

s given of 27 references to the literature.

c plague, K. F. MEYER. (Univ. Calif.). (*Amer. Jour. Pub. Health,* , *No. 11, pp. 1225–1230*).—Included in this report is a list of some nown to suffer from sylvatic plague.

of tubercle bacilli in lesions of garbage-fed swine, W. H. FELDMAN *our. Pub. Health, 29 (1939), No. 11, pp. 1231–1238*).—Report is made of ts of a study aimed at determination of the types of tubercle bacilli

in the lesions of tuberculosis in swine fed uncooked garbage obtained from a large metropolitan area. Of 264 of such hogs, post-mortem examinations of which were made, lesions of tuberculosis were established in 28.4 percent. "All lesions studied were those involving lymph nodes. By culture procedures and the inoculation of guinea pigs, tubercle bacilli were demonstrated in 47. Subcultures were obtained of each of the 47 strains, and the bacillary type of the respective strains was determined by tests for pathogenicity. Guinea pigs and rabbits were used. Thirty-five, or 74.5 percent, of the strains were tubercle bacilli of the avian type, and 12, or 25.5 percent, were tubercle bacilli of the human type."

The presence of avian tubercle bacilli in apparently pure cultures of diphtheroids, J. McCarter and E. G. Hastings. (Univ. Wis.). (*Jour. Infect. Diseases, 64 (1939), No. 3, pp. 297–301*).—Several species of diphtheroids have been isolated from bovine and porcine tissues cultures, which when inoculated into experimental animals produced avian tuberculosis. Purified cultures of the diphtheroids did not produce tuberculosis. It is shown that the avian tubercle bacilli and these diphtheroids will grow commensally and the growth of the tubercle bacilli may not be macroscopically detectable. Because diphtheroid and acidfast organisms are found in the same culture, the assumption cannot be made that the culture is pure and that the diphtheroid is one phase in the life cycle of the acidfast.

Studies in active immunization against undulant fever.—I, Antibody production by rabbits immunized with heat-killed Brucella abortus alone and simultaneously with heat-killed Bacillus typhosus, J. A. Kolmer and A. Bondi (*Jour. Immunol., 37 (1939), No. 5, pp. 489–506*).—The investigation reported, details of which are given in 11 tables, has shown mice to be susceptible to "virulent *B. abortus* and *B. melitensis* upon intra-abdominal inoculation with large numbers and succumb to peritonitis with an associated septicemia. They have been found suitable for protective tests with the sera of rabbits immunized with a heat-killed vaccine of *B. abortus*. The sera of rabbits immunized simultaneously by subcutaneous injections of heat-killed vaccines of *B. typhosus* and *B. abortus* showed as much agglutinin and protective antibody for *B. typhosus* as did those immunized with the typhoid vaccine alone. Rabbits immunized simultaneously with subcutaneous injections of vaccines of heat-killed *B. abortus* and *B. typhosus* produced agglutinins and bacteriotropins for *Brucella* to the same degree as those immunized with *Brucella* vaccine alone. The sera of normal rabbits and of those immunized with typhoid vaccine are occasionally very slightly protective for mice inoculated intra-abdominally with lethal doses of *B. abortus* and *B. melitensis*. The sera of rabbits immunized with a heat-killed vaccine of *B. abortus* contained larger amounts of protective antibody for mice inoculated intra-abdominally with lethal doses of virulent *B. abortus* and much larger amounts for virulent *B. melitensis*. The sera of rabbits immunized simultaneously with heat-killed vaccines of *B. abortus* and *B. typhosus* were found to contain as much protective antibody against virulent *B. abortus* and *B. melitensis* as those immunized with the *Brucella* vaccine alone. The possibility of effective simultaneous immunization of human beings against typhoid and undulant fevers with a mixed heat-killed vaccine is discussed."

The cerebrospinal fluid in the bovine: Its composition and properties in health and disease, with special reference to "turning sickness," J. Carmichael and E. R. Jones (*Jour. Compar. Pathol. and Ther., 52 (1939), No. 3, pp. 222–228*).—In the course of the investigation reported, 33 specimens of "cerebrospinal fluid from known healthy bovines have been examined, and normal values established in regard to cell count, globulin, Lange's colloidal gold

nd chemical constituents. Fifteen specimens of cerebrospinal fluid from g sickness cases were examined, in which the chief changes noted were sed cell count globulin and total protein, and in one case a positive Lange m. Five specimens of cerebrospinal fluid taken from cases of rinderpest, iosomiasis, and East Coast fever showed little abnormality."

ults of blood cultures on seven heifers artificially infected with lla abortus, C. P. FITCH, L. M. BISHOP, W. L. BOYD, and M. D. KELLY. . Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. 753, pp. 683–* -Work conducted in continuation of that previously noted (E. S. R., 76, p. ias shown that *B. abortus* can be isolated from the blood stream of Bang- d cattle during the incubation period and until the time of parturition. animals it was demonstrated after parturition.

vaccination of calves against infectious abortion, A. THOMSEN (*Jour. r. Pathol. and Ther., 52 (1939), No. 3, pp. 192–200*).—Following a review *icella abortus* vaccination work with calves, particularly in the United , report is made of field experiments in Denmark in which *B. A. I. rtus* strain No. 19 was employed; 486 calves on 6 large farms were used, one-third of which served as controls. The percentage of abortion for treated animals was 3.3 and for the controls 25.1. The author is led to le that in future vaccinations against infectious abortion in cattle living s should be applied to the calves.

iemical study of ketosis in a dairy herd, C. W. DUNCAN, C. F. HUFFMAN, . A. TOBIN. (Mich. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 95 (1939), 3, pp. 690–700*).—This report is accompanied by a list of 37 references.

salpinx in a Holstein cow, J. F. BULLARD. (Ind. Expt. Sta.). (*Jour. Vet. Med. Assoc., 95 (1939), No. 750, pp. 369, 370*).

im protein changes in different types of cattle during immunisation st rinderpest virus, M. H. FRENCH (*Jour. Compar. Pathol. and Ther., 39), No. 3, pp. 183–191*).

skin lesions of bovine tuberculin reactors.—Second report, N. H. ind E. C. HULSE (*Jour. Compar. Pathol. and Ther., 52 (1939), No. 3, pp. 1, pls. 13*).—In reporting further (E. S. R., 77, p. 540), a detailed descrip- given of skin lesions of cattle as observed by the authors. The reaction se animals to avian and bovine tuberculins is considered, and report of the geographical distribution of the cases received. The failure to uce the condition experimentally and failure of cultural and biological iations with skin-lesion material are recorded. It is pointed out that gh it seems very probable that these skin lesions are associated with berculin reactions, there is no proof either that the skin lesions are able voke a response to tuberculin or that the acidfast organisms described cause of the sensitization or even of the development of the skin lesions. y case histories presented in an appendix supplement those given in the contribution.

lies on bovine gastro-intestinal parasites.—I, The mode of infection hookworm and nodularworm, R. L. MAYHEW. (La. State Univ.). *ll Vet., 29 (1939), No. 4, pp. 367–376, fig. 1*).—A controlled experiment, eported, indicates that cutaneous infection occurs with the larvae of the orm *Bunostomum phlebotomum* in the calf. "Four preliminary experi- suggest cutaneous infection although licking of larvae from the hair may ccurred. Four instances of cutaneous infection with nodular worm larvae orded in three calves. One additional experiment is described in which ection may have been either cutaneous or oral or both. Two experiments scribed in which no precautions were taken to prevent the calves licking

the larvae from the hair but otherwise conducted under controlled conditions of infection. It would seem, therefore, quite important that the places where cattle, especially calves, lie down, such as the shade and the barn and barn lot, should be taken into consideration in the program of parasite control of the hookworm and nodular worm."

The gastro-intestinal helminths of cattle in Queensland: Their distribution and pathogenic importance, F. H. S. Roberts (*Roy. Soc. Queensland, Proc., 50 (1938), pp. 46–54, fig. 1*).—It has been found that parasitic gastroenteritis of cattle, of quite common occurrence in Queensland and most prevalent among young animals, is due chiefly to *Haemonchus contortus* Rud., *Cooperia pectinata* Rans., *C. punctata* v. Linstow, and *Oesophagostomum radiatum* Rud. Pathogenic infections of *Paramphistomum cervi* Schrank, *P. explanatum* Crep., *Moniezia benedeni* Moniez, *Bunostomum phlebotomum* Raill., and *Strongyloides papillosus* Wedl. have also been seen. The contribution includes a list of 41 references to the literature.

The mineral content of the lungs of normal sheep as compared with that of the lungs in "lunger" disease, H. Marsh and E. P. Wilson. (Mont. Expt. Sta.). (*Cornell Vet., 29 (1939), No. 4, pp. 345–351*).—In order to secure information as to the etiological relation of the irritation produced by inhalation of dust particles to progressive pneumonia, or lunger disease, the lungs of 14 normal and 13 affected sheep were collected and analyzed for silicon, iron, aluminum, calcium, magnesium, and phosphorus. Details of the findings are given in tables. It is concluded that, while there was an increase in percentages of the minerals present in the diseased group varying from 17 to 90 percent, there is no justification for assuming that this rather slight difference indicates any causal relation between these minerals and the pathological condition. It is considered more likely that the increase in mineral content is the result rather than the cause of the disease.

Prevention of ovine mastitis by the use of staphylococcus toxoid, F. C. Minett (*Jour. Compar. Pathol. and Ther., 52 (1939), No. 3, pp. 167–182, pls. 5*).—A review of literature on ovine mastitis, more particularly in respect to the staphylococcus form of the disease and accompanied by a list of 27 references, is first presented. Experiments conducted, details of which are given in tables, show that "treatment with specific toxoid prevents the general effects and to a considerable extent the local effects resulting from an infusion of staphylococcus culture and toxin into the udder. It can probably be assumed that toxoid would act similarly in nature. Under the conditions of the experiments, two injections of toxoid at an interval of about 3 weeks gave a better immunity than a single dose. Immunity was evident for at least 3 mo. after the second injection. In a single experiment one dose of alum toxoid gave a rather better immunity response than two doses of unprecipitated toxoid. The amount of antitoxin developing in sheep treated with toxoid tended to be greater in animals with higher preinjection titers. In sheep judged to be adequately protected antitoxin levels average 8 to 24 units per cubic centimeter serum were observed 10 to 20 days after treatment, representing increases of 6 to 15 times the preinjection titer. Unprotected sheep with low antitoxin titers suffer more severely from the test inoculation than those with higher titers."

Actinobacillosis in rams, C. L. Davis and G. W. Stiles. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. 753, pp. 754–756, figs. 2*).—Report is made of an outbreak in New Mexico due to *Actinobacillus lignieresi*, in which 6 of a band of 80 rams were infected. The lesions present were confined to the lips and skin of the face and neck, with involvement of the adjacent lymph nodes.

fection is thought to have been introduced by the penetration of needlegras through the skin tissues.

ection of follicular fluid from the ovary of the mare, F. N. Andrew F. McKenzie. (Mo. and Mont. Expt. Stas. and U. S. D. A.). (*Jour. Amer Med. Assoc., 95 (1939), No. 753, pp. 763, 764, fig. 1*).

oratory diagnosis of encephalitis due to the equine virus, P. J uch and R. F. Feemster (*New England Jour. Med., 221 (1939), No. 17 3–655*).

***romolecular components of chick embryo tissue diseased with th* of equine encephalomyelitis,** A. R. Taylor, D. G. Sharp, H. Finkelstein W. Beard (*Soc. Expt. Biol. and Med. Proc., 42 (1939), No. 2, pp. 462–46!*).

lies on the immunology of toxic substances produced by streptococc *ed from equine encephalomyelitis*, G. T. Kensler (*Jour. Amer. Vet. Med 95 (1939), No. 753, pp. 730–732*).—The work reported has shown tha *trains of streptococci isolated from cases of equine encephalomyelitis pro* ltrable toxic substances and that such toxic substances can be titrated o mbryos and white mice. An incubation period of from 8 to 10 days wa or their production. "No relationship exists between toxicogenicity an enicity, as determined on chick embryos. Filtrates are rendered atoxi *cific immune serum and formalin. Streptococci isolated from poliomyeliti* roduce toxic substances. Formalinized filtrates and chick-embryo vaccin e comparable degrees of immunity."

tion of age to immune response of mice to formolized equine enceph elitic virus, I. M. Morgan (*Soc. Expt. Biol. and Med. Proc., 42 (1939) pp. 501–503*).—The author has found that the ability of mice to be im ed by means of formolized virus of eastern equine encephalomyelitis in *with age, as shown by the strikingly higher resistance of older immunize* o the intracerebral injection of active virus, as well as by the amount o lizing antibodies developed.

cases of malignant neoplasm in dogs, L. B. Sholl, R. Langham, and Sales. (Mich. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 95 (1939) 3, pp. 757–759, figs. 6*).

try diseases: Their prevention and control, L. D. Bushnell and M. J aus (*Kansas Sta. Bul. 284 (1939), pp. 125, figs. 38*).—This is a revision o n 247 (E. S. R., 62, p. 670) in which more recent findings have been rated.

erimental studies on the virus of infectious avian encephalomyelitis Olitsky (*Jour. Expt. Med., 70 (1939), No. 6, pp. 565–582, pls. 3*).—A de report is made of an investigation of the so-called *epidemic tremor* o chickens, first described by Jones in 1932 (E. S. R., 69, p. 112) and late ed upon by Van Roekel, Bullis, and Clarke (E. S. R., 80, p. 546), under- because of the possible relationship of this disease to equine encephalo- s. It was shown that the transmissible causal agent of this disease of chickens is a virus with traits of its own and distinct from the virus ne encephalomyelitis. The experimental findings provide a basis for the cation of the avian virus. The criteria relate to its antigenicity and ical reactions; to its size and various other physical properties; to its enicity by various routes of inoculation; and to its capacity to induce histopathological lesions.

afiltration of the virus of infectious avian encephalomyelitis, P. K. y and J. H. Bauer (*Soc. Expt. Biol. and Med. Proc., 42 (1939), No. 2, pp. 5*).—It was found that the virus particles of infectious avian encepha-

lomyelitis as present in suspension of brain of chickens affected by the experimental disease have a diameter of 20 to 30 mμ as determined by ultrafiltration through gradocol membranes.

Pathology of spontaneous and experimental cases of epidemic tremor, E. JUNGHERR. ([Conn.] Storrs Expt. Sta.). (*Poultry Sci., 18 (1939), No. 5, p. 406*).—Report is made of the pathology of so-called epidemic tremor or infectious avian encephalomyelitis of chicks as studied in approximately 250 spontaneous and 45 experimental cases from the viewpoint of (1) relation of diagnostic lesions to symptoms, (2) relative frequency of visceral and central nervous system (C. N. S.) lesions, (3) severity and distribution of brain lesions, and (4) histology of visceral and brain lesions. "All pathologic lesions were microscopic in character. Of histologically positive field cases, 36.9 percent showed ataxia, 18.3 percent tremor, and 35.3 percent both; 9.2 percent failed to exhibit clinical abnormalities. Experimental cases showed ataxia within 12–20 days following intracerebral inoculation. Natural cases exhibited lesions in the pancreas in 70.8 percent and the liver in 34.2 percent. Experimental cases failed to show significant visceral lesions." Visceral lesions of spontaneous cases consisted of nodular or diffuse accumulations of lymphoblastlike cells with mitotic figures. "The brain lesions in both the spontaneous and experimental cases were focal and inflammatory. Mural and perivascular lymphocytic infiltration of capillaries which showed considerable endothelial hyperplasia was the most striking finding. A reactive perivascular astrocytosis and intervascular neuroglial proliferation was demonstrated in the lesions by specific metallic impregnations. The primary reaction was not a focal glial one as has been stated elsewhere."

A study of aqueous colloidal sulphur in the control of fowl coccidiosis caused by Eimeria tenella, C. D. CARPENTER. (Univ. Ky.). (*Poultry Sci., 18 (1939), No. 5, p. 403*).—In the tests conducted, 15,000 sporulated *E. tenella* oocysts produced no appreciable hemorrhage nor coccidiosis lesions when the mash contained 3 parts of 6.14 percent aqueous colloidal sulfur and was fed for 5 days before inoculation, although 20 percent of the controls died and at autopsy the remainder all showed severe coccidial lesions. "Against 25,000 sporulated oocysts this same percentage resulted in 20 percent of the chicks showing lesions of coccidiosis at autopsy and 80 percent protection, with no mortality. Five percent aqueous colloidal sulfur in the mash resulted in minute traces of hemorrhage on the seventh day. No severe lesions of coccidiosis appeared at autopsy. Ten parts aqueous colloidal sulfur in the mash against 50,000 and 75,000 sporulated oocysts resulted in slight hemorrhage, no mortality, and 10 percent lesions in both lots. Exposure to infected chicks and litter for 29 days failed to produce lesions of coccidiosis in susceptible chicks when the mash contained 10 parts of this sulfur. One percent aqueous colloidal sulfur administered in the drinking water for 10 days prior to inoculation failed to protect against mass doses of from 7,500 to 50,000 sporulated oocysts."

The effects of variable dosages of sporulated Eimeria acervulina oocysts on chickens, E. M. DICKINSON. (Oreg. Expt. Sta.). (*Poultry Sci., 18 (1939), No. 5, p. 404*).—Report is made of observations of 48 laying pullets 213 days old, reared free of coccidiosis, into the crop of 36 of which sporulated *E. acervulina* oocysts were administered. "They were divided into 4 lots of 12 birds each. Chickens in lot 1 received approximately 25,000,000 oocysts in 1 inoculation. Chickens in lot 2 received 5 daily inoculations of approximately 5,000,000 oocysts each day. Chickens in lot 3 received 50 daily inoculations of approximately 500,000 oocysts each day. Chickens in lot 4 were retained as uninoculated controls." This resulted in a drop in feed consumption, loss in body weight,

ion of egg production, and changes in the feces. "The changes in the were most noticeable between the fourth and ninth days after the first ation and were as follows: Decreased quantity voided, slimy mucoid cter, and the presence of masses of oocysts. The degree and duration of fects on the birds in the 3 inoculated lots varied according to the number orulated oocysts received in the daily inoculation."

e effect of sulphur against artificial infection with Eimeria acervulina imeria tenella, E. M. Dickinson and R. H. Scofield. (Univ. Calif. et al.) try Sci., 18 (1939), No. 6, pp. 419–431, figs. 7).—In three trials E. acervulina ised to infect chickens fed 2, 10, and 20 percent flowers of sulfur in the r ration 6 or 8 days before and 6 or 8 days after inoculation with approxi- y 35 or 50 million sporulated oocysts. A definite adverse effect was in all birds inoculated regardless of whether or not they had been fed 's of sulfur in the ration. In the three trials in which E. acervulina was o infect the birds, mortality as the result of the infection was noted only third in which chicks 78 days of age were inoculated. These trials indi- that age may have some influence on the severity of the disease. In the l and third trials 100 days after the first inoculation "of approximately ,000 sporulated E. acervulina oocysts, a second inoculation of approxi- y 50,000,000 of the same culture was given to all surviving birds. The on, insofar as average body weight and feed consumption are concerned, tes that no perceptible resistance or immunity had been developed from rst inoculation." In four trials in which E. tenella was used to infect ns fed "10 percent flowers of sulfur in the regular ration 7 days before days after inoculation with approximately 250,000 sporulated oocysts, a e protective influence was imparted to the birds fed the flowers of sulfur s manner. All the other chickens inoculated at the same time with the dosage and culture of E. tenella that were not fed flowers of sulfur de- d severe manifestations of E. tenella infection. Birds protected by flowers fur from E. tenella infection later proved to be highly susceptible to a of approximately 250,000 or 500,000 sporulated E. tenella oocysts, while usly inoculated control birds that developed severe manifestations of E. infection proved to be highly resistant to the later inoculation. This indicate that the protective effect imparted by flowers of sulfur took place the sporozoites invaded the epithelial cells. Further, birds protected by shed only small numbers of oocysts in the feces."

nsmission of erythroleukosis in young chickens, C. M. Hamilton and Sawyer. (Wash. Expt. Sta.). (Poultry Sci., 18 (1939), No. 5, pp. 388– –In an investigation of an outbreak of erythroleucosis in two pens of young ns at the Western Washington Experiment Station in the spring of 1935 lent strain of the causative virus was secured from chickens 39 days of "This strain was characterized by the presence in bood films of erythro- and distorted erythrocytes and in a few films of immature myeloblastic This strain of erythroleucosis was transmitted through 12 successive of young chickens by intravenous inoculation. The minimum interval n inoculation and death was 5 days, the maximum 27, and the average The interval between inoculation and death was not consistently reduced passage progressed through the successive groups. All chickens inocu- intravenously or intraperitoneally succumbed to the disease. Twenty t of those inoculated within the bursa of Fabricius died of erythroleucosis. plication of the inoculum to the scarified mucous membrane of the cloaca to produce the disease. Changes which were typical for erythroleucosis

were identical in blood films from both spontaneously infected chickens and experimentally infected chickens."

The effects of hard X-rays and ultra-violet light upon fowl pox virus in vitro, R. Graham, C. A. Brandly, and N. D. Levine. (Univ. Ill.). (*Cornell Vet., 29 (1939), No. 4, pp. 383-391*).—In the experiments reported "suspensions of fowl pox virus grown on the chorioallantoic membranes of developing chicken eggs were irradiated with X-rays and ultraviolet light. Dosages up to 888 r-units of hard X-rays were used, with no effect which could definitely be attributed to the X-rays. The virus was inactivated by ultraviolet light from a mercury vapor lamp in 2 hr. at 20 cm. and attenuated by irradiations of from 15 to 90 min. A concentration of 1-50,000 methylene blue added to the virus suspension reduced the irradiation time necessary for inactivation to 5 min., while a 2.5-min. irradiation markedly attenuated the virus." A list is given of 24 references to the literature cited.

Domestic fowls as hosts of the poultry gapeworm, E. E. Wehr. (U. S. D. A.). (*Poultry Sci., 18 (1939), No. 6, pp. 432-436*).—In the work reported, various species of domestic poultry were experimentally fed infective gapeworm material in order to determine their susceptibility "to infection with *Syngamus trachea*, and to determine the duration of infection in each kind of bird. The results of these experiments show that the guinea fowl, the young chicken, and the turkey are important hosts of gapeworms, that lung but not tracheal infections can be produced in the pigeon, and that the domestic pigeon and duck are unsuitable hosts for the poultry gapeworm. Experiments in which the above species of domestic fowls were fed infective gapeworm material in order to determine how long each may remain a carrier of *S. trachea* show that chickens, infected when very young, may retain their infection for as long as 147 days, guinea fowls for 98 days, and turkeys for 224 days."

The influence of bacteria of the genus Salmonella on the pullorum agglutination test, R. Nadal and A. R. Winter. (Ohio State Univ.). (*Poultry Sci., 18 (1939), No. 5, p. 408*).—In the work reported "birds were inoculated with suspensions of live and dead organisms of *S. gallinarum*, *S. aertrycke*, *S. anatis*, *S. enteritidis*, *S. paratyphi*, and two commercial fowl typhoid-cholera bacterins. They were tested at weekly intervals by the standard tube and whole-blood pullorum tests. *S. gallinarum* and commercial fowl typhoid-cholera bacterins interfered with the pullorum tests for 2 weeks after inoculation. Some of the other organisms produced antibodies which agglutinated homologous antigens but not pullorum antigen. All of the organisms tested were pathogenic for day-old chicks but not for 20-week-old birds."

Upper digestive tract trichomoniases in chickens, N. D. Levine and C. A. Brandly. (Univ. Ill.). (*Poultry Sci., 18 (1939), No. 5, p. 407*).—The results of studies of a disease of the upper digestive tract of chickens caused by *Trichomonas gallinae* in two Illinois flocks are reported. They indicate that chickens are relatively resistant to this affection, but that individual differences in resistance and concomitant diseases may allow the protozoa to set up a pathologic condition.

Selenium and duck sickness, A. C. and S. J. Twomey. (Univ. Ill.). (*Science, 83 (1936), No. 2159, pp. 470, 471*).—The authors' experiment has shown that low concentrations of selenium produce poisoning in ducks, the syndrome in which is identical with that produced by *Clostridium botulinum* type C. Selenium may be a contributing factor in duck sickness.

Selenium and duck sickness, A. C. and S. J. Twomey and L. R. Williams. (Univ. Nev. et al.). (*Science, 90 (1939), No. 2346, pp. 572, 573*).—In work

ıcted in continuation of that above noted, field materials have been secured h indicate that selenium is an important factor in western duck sickness e areas studied. "Analyses of the livers of ducks and shore birds found : of duck sickness in the Great Bear marsh area, Utah Lake, and the lake project, 15 miles northwest of Salt Lake City, showed definite traces lenium. Black ducks and mallards collected in the vicinity of Pymatuning ıp, Pa. (a nonseleniferous area), exhibited negative tests when treated in nanner. . . . A marked decrease in the size and weight of livers was noted e specimens obtained from waterfowl dying of the duck sickness. This ırts the experimental finding that ducks which were poisoned on low conations of selenium as sodium selenite (up to 18 p. p. m.) fed in the drinkwater showed a reduction in the size and weight of the livers. The 'imental birds also showed all the symptoms of western duck sickness in ssive stages. Higher concentrations of selenium produced death within 24 hr., and the birds died without perceptible shrinkage of livers. . . . waterfowl poisoned with selenium probably ingest it in either an organic ırganic form from small, restricted areas."

ɘudomonas infection in turkeys, H. J. Stafseth. (Mich. State Col.). *ltry Sci., 18 (1939), No. 5, p. 412).*—Report is made of a study of a hemolytic *lomonas* that was isolated in pure culture from the heart and liver of a tly dead turkey that came to attention during the investigation of an 'eak of a disease in approximately 19,000 turkeys with a morbidity rate of y 50 percent and a low mortality. "Stained smears from the heart blood iver showed numerous pleomorphic, at times granular or irregularly stained In most respects this organism resembles *P. aeruginosa.* No indole is ıced. Dextrose is fermented by the original strains and not by some of repeatedly passed through animals. No growth has been obtained on n plates. Growth and liquefaction in gelatin stabs are slow and slight. ıs milk is reduced and peptonized without perceptible coagulation. No agglutination has been obtained with *Proteus* X19. It is pathogenic for ys, chickens, pigeons, rabbits, guinea pigs, rats, and especially so for mice. ıutstanding post-mortem changes are: Very dark and often uncoagulated even hours after death, occasionally pin-point or tiny streaklike yellowray foci in the liver, mottled spleen, and mucous and hemorrhagic enter-One turkey showed distinct greenish color in the lungs, liver, and testicles ınother one in the liver alone. Two chickens developed keratitis. From ially infected birds the organism has been isolated from the following s: Eyes, crop, proventriculus, intestines, heart, liver, spleen, kidneys, les, and a subcutaneous abscess."

ıervations on the specific cause and the nature of "quail disease" cerative enteritis in quail, C. C. Bass (*Soc. Expt. Biol. and Med. Proc., 939), No. 2, pp. 377–380).*—In this contribution the author records the prey unrecognized specific cause of quail disease (a Gram-negative bacillus), bes the technical method employed in its detection, directs attention to the ic carrier as a factor in maintaining and spreading the infection, and reobservations indicating transmission of the infection to young quail chicks gh eggs laid by carriers. The Gram-positive *Corynebacterium* described by y and Wetmore (E. S. R., 76, p. 398), which is found in open ulcerated s, is said to be a secondary invader rather than the specific cause of the ion. "The disease is characterized by numerous lentil-shaped intestinal located mostly in the lower third of the ilium and less numerous in the They vary in size from pin-point to half the circumference of the intestine en larger. The small pin-point lesions are buried deep in the mucous

membrane, between, and involving the villi. Larger lesions present an open, craterlike ulcer, with very much thickened base. In microscopic sections through the very small lesion one finds it to consist of a mass of necrotic tissue, containing large numbers of Gram-negative bacilli which can be seen to be invading the surrounding living tissue. In sections through larger lesions with open ulcers one finds this same Gram-negative bacillus and also many other secondary organisms, especially near the surface. If a small unbroken lesion (necrotic plug) is teased out, crushed on a slide, and stained, one always finds large numbers of the characteristic organism. Occasionally spores can be found on slide preparations made direct from the lesions.

"I have isolated this organism in pure culture seven times—five from intestinal lesions, one from a similar very small metastatic lesion in the liver, and one from the yolk sac of a baby quail. It is strictly anaerobic and grows slowly. The best growth I have obtained has been in glucose agar (0.25 percent agar), to which was added a small amount of an aqueous extract of macerated quail intestine (lower third of ilium). Oxygen must be driven off by boiling the medium before it is inoculated. In properly inoculated tubes of such medium the organism grows, in very small colonies, to within about 1 cm. of the surface. The best technic I have used for demonstrating the specific organism is as follows: (1) Kill a sick bird, (2) clip out a piece of intestine containing a very small lesion that has not ulcerated into the lumen, (3) wash this tissue by shaking it vigorously in salt solution, (4) spread it out on a slide or glass plate, (5) with two teasing needles dig out the small grayish plug, (6) place it on a slide and crush and spread with the end of another slide, (7) fix with heat, and (8) stain by the Gram technic. In carefully controlled experiments I have transmitted the disease to clean birds by feeding droppings from sick birds, macerated diseased intestine, macerated remains of the yolk sac (in which the bacilli had been found) of a 19-day-old quail, and pure cultures of the organism; also by placing clean birds in contaminated cages with, or just after the removal, of diseased birds. Death in such infected birds usually occurs within a few days, especially if they are young birds (half grown or younger). Of a large number of adult birds infected in my laboratory about January 1, 1939, about 75 percent died during the first 2 mo., about 15 percent during the third month, and about 4 percent during the fourth month. A few live still longer. During the entire period such birds are carriers and potential sources of infection to other birds. . . .

"In two instances, one a 14-day-old quail and the other a 19-day-old bird, dead of quail disease, I have found the characteristic Gram-negative organism in a small encysted tumor of the remains of the yolk sac. The bacilli were arranged in small masses or clumps within the tumor mass and gave the appearance of very small colonies that had grown there. The organism was isolated in pure culture from one of the yolk sacs (the 14-day-old bird), and the disease was produced experimentally in a clean bird by feeding a part of the material direct from the other. Although I have not been able to find the specific organism in an egg before hatching, the observations recorded above indicate that very young birds acquire quail disease through eggs infected with the specific organism and laid by carriers of the infection."

The coccidia infesting the cottontail rabbit (Sylvilagus nuttallii grangeri (Allen)), with descriptions of two new species, R. F. Honess. (Wyo. Expt. Sta.). (*Parasitology, 31 (1939), No. 3, pp. 281–284, figs. 3*).—Descriptions are given of the new species ***Eimeria maior*** and ***E. environ***, found in the contents of the colon and cecum of the cottontail rabbit in Wyoming.

AGRICULTURAL ENGINEERING

icultural engineering investigations at the Puerto Rico Station] *› Rico Sta. Rpt. 1938, pp. 10–18, figs. 3*).—This report notes completion :rimental bench terraces on the Las Mesas property at a cost of $743 e, of narrow bench terraces at costs from $385 to $502 per acre, and of d mangum terraces at a cost of $95 per acre; discontinuation by the of bench terrace construction as a farm practice; development of ıs for calculating the quantity of earth moved in building bench terraces; ed costs of terraces with greater bench width and height, with greater ınd with increased bank slopes; formulas for calculating bench area and e moved; continued construction of mangum terraces; construction of canals as an economical erosion control measure; effectiveness and y of vegetative covers for soil-erosion control; importance of crop selection erosion control measure; growing of tree crops on hillsides with little loss; and a new dam embodying an automatic device for flood control.

:icultural engineering investigations by the Texas Station] (*Texas ›t. 1938, pp. 106–108*).—This report contains notes on mechanical harvest- cotton, including snapping qualities of cotton bolls, by H. P. Smith, D. T. ;h, and D. L. Jones; factors of efficiency in the distribution and placement onseed and fertilizers, including machine placement and soil disturbance , treatment of cottonseed for planting purposes, width of furrow openers, ect of press wheels, and atmospheric exposure tests of wire and fencing, Smith; and garlic drying, by Smith, G. E. Altstatt, and A. A. Dunlap.

ace water supply of the United States, 1937, parts 1, 8; 1938, 4, 7, 9, 10, 13, 14 (*U. S. Geol. Survey, Water-Supply Papers 821 pp. VIII+441, pl. 1; 828, pp. VII+437, pl. 1; 854, pp. V+149, pl. 1; 857, -197, pl. 1; 859, pp. VI+285, pl. 1; 860, pp. IV+103, pl. 1; 863, pp. VI+ 1; 864, pp. V+184, pl. 1*).—These papers record measurements of stream ;o. 821 covering the North Atlantic slope basins and No. 828 the western f Mexico basins, for the year ended September 30, 1937; and No. 854 ıg the St. Lawrence River Basin, No. 857 the lower Mississippi River No. 859 the Colorado River Basin, No. 860 the Great Basin, No. 863 the River Basin, and No. 864 the Pacific slope basins in Oregon and lower ›ia River Basin, for the year ended September 30, 1938.

ace water supply of Hawaii, July 1, 1936, to June 30, 1937 (*U. S. urvey, Water-Supply Paper 835 (1939), pp. IV+112*).—This report presents :ements of stream and ditch flow in the Territory.

logy and water resources of the Mud Lake region, Idaho, including :and Park area, H. T. Stearns, L. L. Bryan, and L. Crandall (*U. S. Geol. ;, Water-Supply Paper 818 (1939), pp. V+125, pls. 13, figs. 9*).—A phenom- ıcrease, beginning about 1900, in the aggregate area of Mud Lake and p of smaller associated lakes of recent origin was traced to percolation gation water from the Egin Bench, about 30 miles distant. Methods for ding the use of the water supply of the area by drilling wells and ıg the underground reservoir formed by the water-bearing basalt are ›ed.

ll reservoirs for stock water and irrigation, O. W. Monson (*Montana ir. 154 (1939), pp. 33+[1], figs. 16*).—The need for artificially made stock- reservoirs arises from the often excessive distances between natural ng places, and the need of artificial reservoirs for irrigation purposes of the character of the natural run-off of the State, which is such that ive flows of water, reaching flood stages, occur frequently during May

and June, followed by drying up of streams to such a degree as to cause serious water shortage in July and August. Differences, often reaching 400 percent, in the run-off from the same watersheds in two consecutive years add to the urgency of the problem, of which a suggested solution is control of all streams by constructing dams and reservoirs which will store the run-off for stock water and irrigation.

This circular deals with the location, design, and construction of small earth dams and the costs of such works and contains supplementary information concerning the measurement of the capacity of a reservoir (appendix A), the staking out of a small earth dam (appendix B), and the calculation of the run-off from watersheds of various sizes (appendix C). It is a revision of Bulletin 301 (E. S. R., 73, p. 856).

Colloids in sewage and sewage treatment.—I, Occurrence and role—a critical review, W. RUDOLFS and H. W. GEHM. (N. J. Expt. Stas.). (*Sewage Works Jour., 11 (1939), No. 5, pp. 727–737*).—A critical review indicates that various methods of measurements produce widely varying results. The sewage solids are classified as settleable, dispersed, pseudo- and true colloidal sols, and soluble solids. The true colloidal sols probably amount to less than 10 percent of the total suspended solids. The proportions of colloids in fresh solids are relatively low, increase during digestion, and decrease as digestion approaches completion. The colloids appear more important in sludge dewatering than dissolved amino and ammonia nitrogen. Bacterial jellies are most important in aerobic processes and streams.

Traction tests of single pneumatic tires versus dual pneumatic tires, E. C. SAUVE (*Michigan Sta. Quart. Bul., 22 (1939), No. 2, pp. 59–71, figs. 8*).—At the recommended inflations of 12 lb. per square inch in 9.00–36 four-ply single and 20 lb. per square inch in 5.00–44 four-ply dual tires, giving approximately equal loaded radius in the two sets, traction, as pounds pull on the tractor drawbar, was greater with the single than with the dual tire sets at the same percentage slippage for all soils and conditions tested as follows: In sand 41.1 percent, disked ground 20.4, freshly plowed around 19, muck (plowed and rolled) 15, sod 13.25, and muck (mint stubble) 11.7 percent. At 16 percent slip, the drawbar pull increase with the single pneumatics for 544 lb. added to the traction members was on sod 400 lb., sand (oat stubble) 280, muck (mint stubble) 250, and freshly plowed ground 280 lb.; with the dual pneumatics under like conditions on sand (oat stubble) 240 lb. and muck (mint stubble) 180 lb. The maximum drawbar pull was obtained with an average slippage of 45 percent. The maximum horsepower was obtained with an average slippage of 23 percent. The coefficient of traction (ratio of drawbar pull at 45 percent slippage to the (zero load) weight on drive wheels) was on muck (plowed and rolled) singles 0.38, duals 0.33; muck (mint stubble) singles 0.55, duals 0.50; silty loam (sod) singles 0.90, duals 0.82; silty loam (freshly plowed) singles 0.62, duals 0.54; sand (oat stubble) singles 0.60, duals 0.49; and silty loam (freshly plowed and disked) singles 0.71, duals 0.60. Changing the spacing of the duals from 9 in. center to center to 7 in. did not appear to affect traction in one comparison.

Life, service, and cost of service of pneumatic tractor tires, E. G. MCKIBBEN and J. B. DAVIDSON (*Iowa Sta. Bul. 382 (1939), pp. 165–186, figs. 5*).—Cooperators using a total of 199 sets of pneumatic tractor tires reported reduced fuel and labor requirements; higher speeds; easier operation on hard surface roads; less damage to farm roads, lanes, meadows, and pastures; decreased tractor breakage and wear; and greater comfort. These users were located in 73 counties and represent the equivalent of 381 yr. of individual observation.

se per year reported ranged from 240 to 3,000 hr., with an average of Hauling constituted, on the average, about 4 percent of the use of rubber-ctors, varying from 0 to 75 percent, with an apparent tendency to increase. rable variation in the rate of tire wear was reported, and the necessity ing excessive slippage was frequently emphasized. Annual maintenance re found to average 28 ct. per set per year, although in individual cases costs averaged as high as $5. The estimated useful life varied from 3 r., with an average of 7 yr., and the estimated useful hours of use 1 6,765. Estimated fuel savings for the same work ranged from 0 to 50 average 22 percent. An average labor saving of 23 percent was reported, range from 5 to 50 percent. The use of a higher gear for most field ns was reported by 54 percent, and 93 percent used a higher gear for at important implement. The use of machines of greater operating width orted by 40 percent. High lug treads were reported as being generally tisfactory, particularly for adverse traction conditions. All but 3 of the who had tried water as a substitute for cast iron wheel weights were with the plan.

antages reported were higher first cost, possibility of delay and expense idental damage, expense of equipping at least part of the drawn equip-th rubber tires, lower maximum drawbar pull under many conditions, bouncing under certain conditions, more objectionable tracks in loose il, and decreased stability for belt work. Over 98 percent of the users, were satisfied with the performance of pneumatic tractor tires.

thors note that the most effective use of a rubber-tired tractor requires est practicable speed, the widest implement which can be pulled satisfac-the engine and tires at this speed, and enough wheel weight to provide traction.

or costs in Michigan, 1938, F. M. Atchley (*Michigan Sta. Quart. Bul.*,), *No. 2, pp. 91–96*).—The cost data here tabulated and discussed were with the cooperation of 45 farmers operating 46 tractors. Expenses of g and maintaining one-plow, two-plow, and three-plow tractors were ly determined. Data concerning type of fuel used (gasoline, "distillate," ene) were obtained, together with consumption figures. Percentage of rking time in various uses was recorded for the three types of tractor, r subjects considered were size of tractor in relation to labor and power urs tractor use and tractor costs, and influence of size of farm.

of tractor power on Nebraska farms, F. Miller, W. L. Ruden, and mith (*Nebraska Sta. Bul. 324* (*1939*), *pp. 18, figs. 3*).—Tractors of less ated drawbar horsepower were found to show a higher total cost per unit than those of higher rating, but the cost per tractor hour was lower for l tractors because of the low power rating. There was no significant dif-n cost per rated drawbar horsepower hour for items except fuel in tractors 11 to 30 hp. Overhead costs per rated drawbar horsepower hour nd to vary inversely with the number of hours the tractor is used annu-tal costs per used drawbar horsepower hour increase as the tractor load s from its rated capacity. To maintain low cost per unit of useful power or should be kept to work that uses a high percentage of its rated power. end the size of equipment may be increased, more than one piece of at may be pulled, a higher gear may be used and the job completed er speed, or a higher gear may be used and the tractor throttled to the quired for the work.

refrigerated storages, E. L. Arnold (*[New York] Cornell Sta. Bul.* 9), *pp. 40, figs. 12*).—This bulletin reports a study of locations of farm

storage plants, structural details including type of building, insulation, type and size of mechanical equipment, produce stored, and owners' opinions with respect to the value of the storage facilities used. The survey covered 138 storage buildings, of which 87 were refrigerated, in Massachusetts, Connecticut, New York, Pennsylvania, and New Jersey, and in the Province of Ontario, Canada.

Of 87 refrigerated storage plants, 80 were used for apples, as were also 40 out of 51 nonrefrigerated storage spaces. Equipment capable of keeping apples until April could be built and operated at a cost of about 16 ct. per stored bushel, whereas the average New York City price during 21 yr. has been 56 ct. per bushel more in April than in October.

The storage room is considered to be best made approximately square, with as high a ceiling as will permit convenient loading; machine room, packing room, and box, crate, and barrel space adjacent. A connected salesroom was found also of value. Types of wall and ceiling construction, insulation, cooling units, source of power, refrigerants, comparative merits of blower and coil cooler systems, etc., are discussed in general terms, and tabulated data concerning storage temperatures, climatic factors, properties of building and insulating materials, and refrigerants are given, but without specific constructional designs or drawings. Among other information brought out in the survey was the fact that 57 percent of the refrigerated storage buildings had blower systems as against 43 percent using coil systems.

A very brief appendix deals with the measurement of heat and of refrigeration and the terms expressing such measurements.

AGRICULTURAL ECONOMICS

[Investigations in field and ranch economics by the Texas Station, 1938] (*Texas Sta. Rpt. 1938, pp. 83–90*).—Included in addition to findings previously noted are (1) brief findings by W. E. Paulson of the relation between prices received and quality of vegetables in the lower Rio Grande Valley; (2) general findings by Paulson and G. S. Fraps as to the relation of price to grade and protein content of wheat in the Panhandle area of the State; (3) findings by L. P. Gabbard and Paulson as to the percentages of the variations in total cost of ginning cotton in different types of plants accounted for by volume of ginning and investment in the gin plant; (4) table by Gabbard and H. C. Bradshaw showing (a) by years 1913–36 the average farm taxes per acre, indexes of such taxes and the prices paid for farm commodities and the ratio of farm taxes to prices of farm commodities, and (b) the total cost and cost per capita of operating 254 county assessor-collectors' offices in 1935, the counties being divided into eight groups according to population; and (5) some findings by Gabbard and C. H. Hamilton in a study of 640 tenant farm records as to percentages of the farm income represented by landowners' income in different sections of the State.

[Investigations in agricultural economics by the Puerto Rico Station] (*Puerto Rico Sta. Rpt. 1938, pp. 4–10, fig. 1*).—Included are tables and charts with brief discussion showing the number and size of farms 1910, 1920, 1930, and 1935, the export values of the 10 principal crops by years 1934–38, and the acreages of principal crops harvested 1935. Sugarcane produced 63 percent of the island income on 39.6 percent of the farming land.

Foreign Agriculture, [November 1939] (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Foreign Agr., 3 (1939), No. 11, pp. 499–542, figs. 8*).—Articles are included on Wartime Control of Agricultural Trade and Production in Belligerent Countries, by H. L. Franklin (pp. 501–508), The Australian Wheat Industry Assistance Scheme, by L. J. Schaben (pp. 509–524), and The Livestock Industry in

ela, by W. H. Black (pp. 525–538). Recent developments in foreign ural policy are noted in items entitled Argentina suspends wheat and l price guaranty, Netherlands Indies rice policy, British food production m utilizes garden plots, and Ireland to expand food production.

use and the internal operation of farms, G. W. Forster. (N. C. Expt. d U. S. D. A.). (*South. Econ. Jour., 6 (1939), No. 2, pp. 165–177*).—Using r 1935 and 1937 for 68 farms in Franklin County, N. C., the effect of programs such as the Soil Conservation Service program and the agri- l conservation program of the A. A. A. on the utilization of farm land issed. The 68 farms included 36 that were taking part in the agricul- nservation program, 16 that were cooperating with the Soil Conservation , and 16 not cooperating with either agency.

rvey of research in forest land ownership (*New York: Social Sci. Res. , 1939, pp. [2]+93*).—This is a report prepared by E. S. Meany, Jr., for a committee on research in forest economics appointed by the Social Research Council. Its object is to review the progress made in research st land ownership and to suggest lines for further investigations. "It is nded to discuss detailed methodology, or even to prepare outlines for the ation of specific projects, but rather to indicate the general area to be and to point out the lines of attack, leaving to the individual investi- e final decision as to the exact field to be covered and the tactics to be d." The report consists of sections on status and trends in forest land ip, origin of present ownership patterns, stability of various classes of and ownership, size of holdings, separate versus combined ownership erland and manufacturing plant, effect of public policies upon ownership, ial aspects of forest enterprise in relation to ownership.

n prices in relation to cotton classification service and to quality ement, L. D. Howell and L. J. Watson. (Coop. N. C., S. C., Ga., Tenn., nd Ark. Expt. Stas.). (*U. S. Dept. Agr., Tech. Bul. 699 (1939), pp. 55,* .—"Information is presented in this bulletin on (1) the influence of kinds of cotton-classification services on prices to growers, (2) factors g the usefulness of a cotton-classification service and some problems lved in connection with establishing and maintaining a practical and ble classification service, and (3) the influence of prices on quality d."

n marketing in the Coastal Plain area of North Carolina, J. W. and G. R. Smith. (Coop. U. S. D. A.). (*North Carolina Sta. Bul. 325 pp. 37, figs. 5*).—This bulletin includes the findings in the study to deter- e marketing practices of farmers, the structure of the local markets, the and selling practices of local buyers, the ultimate destination of cotton d, and the attitude of the farmers toward the present marketing system. cal marketing areas, each consisting of a county and its principal local s, were studied. Data were obtained from approximately 80 farmers in unty and from most of the local buyers, cotton warehouses, and public weighers operating in the counties or in adjacent markets. Data as to vement of cotton from the farm to local markets were obtained from s' records filed with the A. A. A. In the section on farmers' marketing s, the place and time of sale, types of local buyers, credit relationships ıyers, time of ginning and selling, size of lots sold, storage practices, arkets in which sales were made, market information available, and s' knowledge of grade and staple are discussed. In the section on market ation and practices of buyers the physical facilities and organization of s, the integration of cotton buying with other activities pertaining to

cotton and cottonseed, size of market, volume of cotton handled, trade connections and selling practices of local buyers, classification on which local buyers sold cotton, market information available to such buyers, and types of transportation used for delivery of cotton by first buyers are discussed. The attitude of farmers toward sampling and classification services and of local dealers and ginners toward official classification is also discussed.

Cooperative marketing of fleece wool, J. M. Coon (*Farm Credit Admin. [U. S.], Coop. Res. and Serv. Div., Bul. 33 (1939), pp. VI+84, figs. 25*).—This bulletin describes and discusses the development of cooperative wool marketing associations; fleece wool cooperatives—local pools and State and regional associations; operating methods, policies, and problems—financial services, grading and classifying, warehousing, and selling wool, loss in weight of wool, marketing costs, minimum tonnage for efficiency, management and membership problems, and field service and educational work; achievements of the fleece-wool cooperatives; possibilities for further service to growers; and some conditions affecting cooperative activity. An appendix includes a glossary of wool terms, a plan for the organization of a national cooperative wool and mohair selling agency adopted by representatives of the wool and mohair organizations, the form of agreement between member associations and the National Wool Marketing Corporation and between the member associations and the grower, a consent of mortgagee form, and a table showing comparative grades of wool.

Local hog marketing practices in Iowa, G. Shepherd and N. V. Strand (*Iowa Sta. Res. Bul. 262 (1939), pp. 149–184, figs. 22*).—This is a statistical study based on 34,126 A. A. A. hog compliance forms filed in 1933, being a 20 percent sample by counties. Due to the importance of tenancy problems the computations were carried through separately for each tenure group. The findings are reported in tables, charts, and maps by the nine crop-reporting districts of the State, and in many cases by counties. The analyses covered average number of hogs sold, average number and size of lots, average weight of slaughter hogs, seasonal distribution of marketing, numbers of buyers, importance of each kind of buyer and average weights of hogs taken by each, most important kinds of buyers in each county, number of market outlets per farmer, average distance to market, and buyers' trade territories. A preliminary study of Story County to determine the size of sample necessary to provide reasonably accurate approximations of the conditions existing in the population of data is described in an appendix.

Great heterogeneity in marketing practices was evident in weights at which hogs are sold, number of hogs per lot, number of lots, time of year of sales, and distances hauled to market. The differences were most striking between individuals in a given county or district, as shown by the large size of standard deviations. A similarly high degree of heterogeneity existed in the marketing system, the sales being made to or through a dozen or more different kinds of buyers in percentages varying greatly from farm to farm and from county to county. Although one or more packing plants were within easy trucking distance of every farmer, except in part of the southwestern part of the State, only 11 percent of the hogs were sold direct by farmers to packing plants of the State and only 6 percent to concentration points (chiefly packer-owned). Of the butcher hogs 48 percent were sold to local buyers, 18 percent through commission men, 11 percent through local cooperatives, 4 percent to other farmers, and 2 percent through other channels. The trade territories of interior packing plants are roughly circular areas with the plant as center. The plants are some distance apart, and their trade areas do not overlap much. The concentration points mostly owned by national packers, appear to be consciously located in the various

interior packing plant territories. "The number of buyers in the State (3,000) is so large and their nature so diverse that one of the physical requirements for intense competition (a large number of buyers) appears to be satisfied." The data, however, do not show whether the economic requirements for perfect competition are satisfied.

Cooperative milk marketing in Louisville, W. C. WELDEN and T. G. STITTS (*Farm Credit Admin. [U. S.], Coop. Res. and Serv. Div., Bul. 32 (1939), pp. VI+88, figs. 17*).—A general description is included of the milk marketing conditions and the development of cooperative milk marketing in Ohio, Indiana, Kentucky, and Tennessee, followed by a more detailed discussion of the same type of the Louisville market and the Falls Cities Cooperative Milk Producers' Association. An analysis is made of the sales program, laboratory and service work, and the membership relations in the Falls Cities Association and of the attitude of the members towards the various types of activities.

[Papers on cooperation] (*11. New England Inst. Coop. Ann. Conf., Kingston, R. I., 1938, Proc., pp. [1]+133*).—Included are papers presented at the eleventh annual conference of the New England Institute of Cooperation held at Rhode Island State College from June 21–23, 1938. The subjects dealt with were some problems of cooperation, the relation of State extension and research services to cooperatives, farm prices and cooperation, membership relations, consumer cooperation, interesting consumers in northeastern food products, regional markets, successful local cooperation, marketing milk cooperatively, and restrictions on the interstate movements of farm products.

Organization structure of farmers' elevators, H. HEDGES (*Farm Credit Admin. [U. S.], Coop. Res. and Serv. Div., Cir. C-115 (1939), pp. [3]+50, fig. 1*).—Information and suggestions are given for the assistance of grain producers in considering questions of reorganization or organization of farmers' cooperative elevators. The generally accepted cooperative principles and the important reorganization problems of existing farmers' elevators are discussed. The organization procedure for new associations is outlined, and suggested forms for organization documents are included.

Costs of credit extension in the sale of farm supplies by cooperative associations, H. E. LARZELERE and D. D. MACPHERSON (*Michigan Sta. Quart. Bul., 22 (1939), No. 2, pp. 72–79, figs. 3*).—A case study was made of the credit situation in six representative farmers' cooperative associations, two representing the dairy and general farming region of the southeastern part of the State, two the potato-growing area of the north central part, and two the fruit-growing section of the western part. The associations were organized as marketing agencies, but the sales of farm supplies constituted from 46.5 to 88 percent of the total sales in 1937.

The percentages of supplies sold on credit ranged from 48.7 to 76.4 for the individual associations. The average credit costs per $100 of total sales were $2.11, ranging from $1.65 to $2.67, and per $100 of credit sales $3.29, ranging from $2.61 to $4.70. Cost of bad debts averaged 91 ct. per $100 of credit sales, that for administrative expense $1.28, and that for interest $1.10. Bad debt losses ranged from 26 ct. to $1.49 per $100 of credit sales, administrative expense from $1.02 to $2.10, and interest cost from 76 ct. to $1.67 in the different associations. For each $100 worth of goods sold by the six associations, the cost of goods and general expenses, exclusive of credit costs, constituted $95.24, leaving a margin of $4.76. The cost of bad debts, credit administration, expenses, and interest costs reduced the margin to $2.65 for all sales, and to $1.47 for the sales on credit.

The authors make the following conclusions: "The type of agriculture in which a cooperative's patrons are engaged is only a partial explanation for the credit practices followed by that organization. The true cost of extending credit is much higher than is indicated by the financial statements of cooperatives and may itself tend to reduce the net income. While the liberal use of credit may expand the volume of sales, its effect is found to be accompanied by a reduction in the net earnings of the associations concerned. The establishment of a definite credit policy will enable the association to adjust its credit operations to the highest level of efficiency."

Cooperative farm supply purchasing in the British Isles, J. G. KNAPP (*Farm Credit Admin.* [*U. S.*], *Coop. Res. and Serv. Div., Bul. 31 (1939), pp. VI+86, figs. 13*).—"The more specific aims of the study are (1) to present information on the development and the present position, and on (2) the organization and the operation of cooperative purchasing associations in the British Isles, and (3) to examine and to appraise this experience in order to obtain suggestions that may be helpful to the most desirable development of cooperative purchasing in the United States."

Farmers' retail petroleum associations, J. G. KNAPP and F. M. HYRE (*Farm Credit Admin.* [*U. S.*], *Coop. Res. and Serv. Div., Cir. C-113 (1939), pp. [2]+20, figs. 13*).—This circular includes general and statistical information on the development, location, methods of organization, operation, and efficiency of agricultural cooperative associations handling petroleum products. It is based on data for the fiscal year 1936 collected in connection with a Nation-wide survey of agricultural cooperatives made by banks for cooperatives in 1937. Only brief reference is made to the operation of farmers' wholesale cooperatives.

Crops and Markets, [October–November 1939] (*U. S. Dept. Agr., Crops and Markets, 16 (1939), Nos. 10, pp. 205–232, figs. 2; 11, pp. 233–256, figs. 2*).—Both numbers include crop and market reports of the usual types.

Prices and index numbers of prices of farm products, Mississippi, 1910–1938, M. GUIN and D. W. PARVIN (*Mississippi Sta. Bul. 332 (1939), pp. [1]+31, figs. 3*).—Tables show for each of the 23 most important farm products of the State, usually for the period 1910–38, (1) the actual prices paid farmers as of the fifteenth of each month, (2) the index numbers (simple relatives) of each price (average 1924–28=100), and (3) the average monthly and yearly prices during the period. A composite weighted index number of 100 was computed for cotton (75.2), cottonseed (9.14), milk, cattle, sweetpotatoes, hogs, eggs, chickens, potatoes, hay, and corn. Tables and charts show these index numbers and those for cotton and cottonseed by months 1910–38.

RURAL SOCIOLOGY

Sociometrics and the study of new rural communities, C. P. LOOMIS and D. [M.] DAVIDSON, JR. (*Sociometry, 2 (1939), No. 1, pp. 56–76, pl. 1, figs. 3*).—The authors conclude that the informal associations in the new communities should be considered in colony administration. They indicate why families left the Dyess colony in Arkansas.

Measurement of the dissolution of in-groups in the integration of a rural resettlement project, C. P. LOOMIS and D. M. DAVIDSON, JR. (*Sociometry, 2 (1939), No. 2, pp. 84–94, fig. 1*).—This is a study of the forces of integration and disintegration in certain communities.

Social agencies in the planned rural communities, C. P. LOOMIS and D. M. DAVIDSON, JR. (*Sociometry, 2 (1939), No. 3, pp. 24–42, figs. 4*).—This study of

seven new resettlement projects indicates the importance of the development of formal organizations in the new communities and how they may be secured.

Informal social participation in the planned rural communities, C. P. Loomis (*Sociometry, 2 (1939), No. 4, pp. 1–37, figs. 8*).—"Forty percent of the reporting families on six resettlement projects stated that they had become acquainted with the families which were visiting them at the time of study through an actual visit on the part of one of the families involved." A larger percentage of the seven resettlement project families borrowed and exchanged work on the project during the year of study than in the community of residence previous to resettlement. The resettlement families reported that the families who visited them more frequently also exchanged work and borrowed farm equipment more frequently, thus combining social and economic activities to a greater extent at the time of study than was the case in the communities of previous residence.

As might be expected, resettled families did not associate with kinsfolk as frequently after resettlement as before. Relatively more associating families on the resettlement projects had children who played together than did other groups, and since children are an integrating force in social life, they may tend to make up for the lack of consanguinity as far as the integration of the resettlement projects is concerned. Families associating with families living on the seven resettlement projects lived closer together than was the case previous to resettlement. Associating families on the seven projects more frequently had common membership in nonreligious organizations and cooperatives than was the case for all other groups, with the exception of Klamath Falls, Oreg. Thus the importance of the cooperative and other project organizations is apparent.

Some comments on the social aspect of prorates, J. M. Tinley. (Univ. Calif.). (*Jour. Marketing, 4 (1939), No. 2, pp. 117–125*).—The comments "deal with social welfare, the possible use of prorates and their probable effects upon different groups, and the theoretical and administrative difficulties involved."

FOODS—HUMAN NUTRITION

Human nutrition (*U. S. Dept. Agr. Yearbook 1939, pp. 95–402, figs. 18*).—This portion of the yearbook (part 1), noted as a whole on page 573, consists of the following topics: From Tradition to Science, by L. Stanley (pp. 97–99); Food Functions and the Relation of Food to Health, by L. E. Booher and C. M. Coons (pp. 100–123); Food Habits, Old and New, by H. K. Stiebeling (pp. 124–130); Can Food Habits be Changed? by P. E. Howe (pp. 131–138); Food Fads, Facts, and Fancies, by H. S. Mitchell (pp. 139–144); The White Rat as a Contributor to Science, by M. H. Friedman (pp. 145–151); Human Food Requirements—Carbohydrates, by H. S. Mitchell (pp. 152–157), Fats, by J. G. Lease (pp. 157–160), and Energy Requirements, by N. B. Morey (pp. 160–172); Protein Requirements of Man, by D. B. Jones (pp. 173–186); Mineral Needs of Man—Calcium and Phosphorus Requirements of Human Nutrition, by H. C. Sherman (pp. 187–197), Iron and Copper Requirements, by M. A. Dickson (pp. 197–211), Iodine and Fluorine, by M. C. Smith (pp. 211–213), and Trace Elements, by E. P. Daniel (pp. 213–220); Vitamin Needs of Man—Vitamin A, by L. E. Booher and E. C. Callison (pp. 221–229), Vitamin B_1, by O. L. Kline (pp. 229–235), Vitamin C, by S. L. Smith (pp. 235–255), Vitamin D, by F. W. Irish (pp. 255–259), Vitamin E, by E. M. Nelson (pp. 259–261), Riboflavin, by L. E. Booher (pp. 261–266), and The Pellagra-Preventive Factor, by O. L. Kline (pp. 266–271); Food Composition, by C. Chatfield and G. Adams (pp. 272–285);

Vitamin Content of Foods, by E. P. Daniel (pp. 286–295); Present-Day Diets in the United States, by H. K. Stiebeling and C. M. Coons (pp. 296–320); Planning for Good Nutrition, by H. K. Stiebeling and F. Clark (pp. 321–340); Microorganisms in Foods and Food Preservation, by H. E. Goresline (pp. 341–349); Enzymes in Foods and Food Preservation, by A. K. Balls (pp. 350–354); United States Meat Inspection, by E. C. Joss (pp. 355–359); Supervision and Inspection of Milk, by E. Kelly (pp. 360–363); Food Grades and the Consumer, by M. Farioletti (pp. 364–371); What the Modern Homemaker Needs to Know, by M. Birdseye (pp. 372–379); and Better Nutrition as a National Goal—The Problem, by H. K. Stiebeling (pp. 380–385), The Problem of Income and Its Distribution, by M. Farioletti (pp. 385–392), Subsidizing Consumption of Foods, by F. V. Waugh (pp. 392–396), and Agricultural Programs and the Nutritional Goal, by J. P. Cavin (pp. 396–402).

[Foods and nutrition research of the Texas Station] (*Texas Sta. Rpt. 1938, pp. 18, 19, 97–100, 143, 144*).—Progress reports, some of which extend earlier work (E. S. R., 81, p. 141), are given by G. S. Fraps and E. C. Carlyle on productive energy of human foods; by J. Whitacre on the effect of tea upon the energy metabolism of children; by S. Cover on the effect of oven temperatures on the tenderness of meat (E. S. R., 82, p. 128); by Cover, A. K. Mackey, and C. E. Murphey on the effect of degree of fatness on tenderness of lamb; and by H. M. Reed on the frozen storage of figs and strawberries and the preserving of strawberries.

Science and nutrition, A. L. BACHARACH (*London: Watts & Co., [1938], pp. XIV+154*).—This book, written primarily for the layman, deals with the chemistry of foods and the chemical changes they undergo upon utilization by the body. The subject matter, approached from the experimental viewpoint, deals with the major food constituents, carbohydrates, fats, and proteins; the major mineral elements; and the vitamins. Brief chapters are devoted to the trace elements, deficiency diseases, and diet and human health.

Comparative costs of home-produced and commercially produced bread and rolls, E. B. SNYDER (*Nebraska Sta. Res. Bul. 115 (1939), pp. 24, figs. 2*).—A combination of survey and laboratory methods was used in this attempt to determine whether or not the home production of bread and rolls is an economical practice for Nebraska women. Information was first secured on the baking habits of 1,300 women, of whom 68 percent lived on farms. It was found that almost 95 percent of the women baked bread and 38 percent baked all of the bread used. Of the women who purchased bread, only 8.5 percent purchased all of the bread used. Corncobs and wood were used as fuel by 70 percent of the women reporting. Coal and kerosene were used more frequently than gasoline or gas, and only a few used electricity.

From 76 women distributed among 6 counties representing different agricultural practices, detailed records were obtained of the amounts and costs of ingredients, fuels, and time used in the production of bread in the home and the kinds, amounts, and costs of bread purchased over a 2-week period. Information was also obtained from commercial bakers of various grades as to the ingredients used in their products. Finally as a check on the information secured in the home, breads were prepared and baked in the laboratory by a standardized procedure adaptable to home use and with a number of fuels.

From the records of the cooperating women, the fuel costs were highest for electricity, followed by natural gas, gasoline, coal, corncobs, and kerosene. In the laboratory the fuels used in decreasing order of cost were electricity, gasoline, kerosene, and natural gas. Disregarding the fuels, the chief factors affecting the cost per pound of bread were cost of flour, kind and proportion of yeast, and

kind of liquid (milk or water). Variations with the source of liquid in the cost per pound of bread baked in the laboratory were water 3.83 ct. per pound, bottled whole milk 5.48, bottled skim milk 4.50, bulk skim milk 4.20, and powdered skim milk 4.28 ct. per pound of bread. Attention is called to the savings in the use of skim milk, particularly in bulk or powdered form.

The savings possible to the Nebraska homemaker in baking bread rather than buying it were calculated in terms of the median cost of commercial breads available in local stores as compared with the cost of ingredients for the home-produced bread alone or in combination with the costs of different fuels. Similar comparisons were made using the average retail price of bread in Omaha and the costs of bread made in the laboratory with different fuels. The savings for white loaf bread, as calculated in various ways, ranged from 2.56 to 5.9 ct. per pound. Similar but somewhat lower savings resulted from the home production of whole wheat bread. The costs of rolls, both homemade and purchased, varied widely, depending upon the ingredients. The ingredients of rolls made by the cooperators ranged from 3.6 to 18 ct. per pound of rolls. The total cost of fancy rolls made in the laboratory ranged from 10.27 to 11.80 ct. and of rolls purchased by the homemakers from 10 to 29 ct. per pound.

The information from commercial bakers showed that the ingredients used were not inferior and were frequently superior in nutritive quality to those in home-produced bread. "Household production of bread appears to be a sound practice in the economic sense. Economic necessity, market value of the time of the homemaker, family preference, availability of commercial products are factors in considering home-produced v. commercial bread."

The relative economy of household production and purchase of four canned vegetables, E. G. Holmes (*Vermont Sta. Bul. 449 (1939), pp. 32, fig. 1*).—The vegetables selected for this study were tomatoes, green snap beans, peas, and greens (spinach, Swiss chard, beet greens, or endive). Information concerning canning equipment was given by 86 homemakers (48 farm and 11 rural nonfarm), of whom 61 kept detailed canning records, 59 spoilage records until the end of May, and 36 records of amounts of all foods canned during the year 1937. The home-canned products were compared as to cost and quality with the corresponding commercially canned vegetables. Samples of the former, obtained for grading, numbered 22 for peas, 31 for snap beans, 39 for tomatoes, and 23 for greens, while the latter included a representative collection of the brands sold locally, low, medium, and high price ranges being represented.

Samples were graded for quality by essentially the same methods as employed by the Division of Fruits and Vegetables of the U. S. D. A. Bureau of Agricultural Economics. The commercial brands on the whole scored higher than the home-canned goods in flavor, tenderness, and stage of maturity. Low flavor scores in the home-canned products were largely due to the use of overripe and underripe vegetables. In general terms, neither price, brand name, nor label served as an indication of the quality of commercial cans of the four vegetables studied. Estimates of the cost of the home-canned products were based on local prices obtained for fresh vegetables, on costs of equipment (original cost and calculated life considered), and on allowances for spoilage. The medians of the local commercial prices for No. 2 cans (No. 2½ for spinach) are taken as representative of the cost of the commercially canned vegetables. When these values were recalculated in costs per pound, the average costs for home-canned (quart jars) and commercially canned products were peas 22.24 and 16.33 ct., snap beans 6.21 and 19.54 ct., greens (spinach) 14.82 and 13.49 ct., and tomatoes 2.83 and 7.98 ct., respectively.

The general conclusion drawn is that the home canning of tomatoes and beans was a profitable operation for the Vermont homemaker, while the canning of greens and peas was unprofitable. In terms of cost and time involved, it was calculated that the housewives were making 50 and 49 ct. per hour for canning tomatoes and beans, respectively, and losing 5 and 15 ct. per hour in canning greens and peas.

Effectiveness of heat penetration in the canning of meat in the home by the pressure cooker, C. I. NELSON and D. BERRIGAN. (N. Dak. Expt. Sta.). (*Jour. Agr. Res.* [U. S.], *59* (*1939*), *No. 6*, *pp. 465–474*, *figs. 5*).—Top round of beef packed in various ways was canned in duplicate under different conditions in a 12-qt. pressure cooker provided with a long-stemmed thermometer, as described by Magoon and Culpepper (E. S. R., 45, p. 560), which could be inserted in the center of one of the cans. The variables tested included type of pack, steam pressure (10 and 15 lb.), can size (Nos. 2, 2½, and 3), duration of process, and methods of cooling (cold dipping and room temperature). The effectiveness of the sterilization was tested by the destruction or survival of various organisms inserted in small ampoules in the center of the meat or injected directly into the meat. These consisted of *Clostridium botulinum* (strains A and B) grown in a well-buffered proteose-peptone broth and aged 5–6 weeks, *Escherichia coli*, a heat-resistant strain of *Streptococcus faecalis* isolated from a can of spoiled meat, and *Bacillus mesentericus*, an organism reported frequently in the spoilage of canned vegetables and meats where leaky cans were involved.

Temperatures were plotted against time, and the area of the curve between 100° C. and the upper limit of temperature possible at the pressure used was considered to measure the actual temperature-time sterilization. The efficiency of any arrangement tested was calculated as the ratio of this area to that of the theoretical sterilizing zone within the same time limits. These percentages may or may not be consistent with the actual bacterial survival tests. As an illustration, in No. 3 cans the effectiveness of the processing of 725 cc. of nutrient broth at 10 lb. pressure was 90.7 percent and all spores were killed; of 725 gm. of pan-fried patties at 15 lb. pressure 16.9 percent, and all forms killed; of 885 gm. of raw cubed beef at 15 lb. pressure 26.3 percent, with *B. mesentericus* surviving and *E. coli* and *C. botulinum* B killed; of 885 gm. of raw ground beef at 15 lb. pressure 83.8 percent, with the same sterilizing effect as in the preceding process. It is noted that *B. mesentericus* is a strict aerobic organism and cannot grow in a perfectly sealed can. Spoilage from this organism is attributable to leaky cans.

The rate of heat penetration with different types of pack decreased in the order liquid, raw meat in chunks, fried ground-meat patties, raw ground meat, solid pack, and raw solid chunk. At 10 lb. steam pressure the temperatures reached in the solid pack were insufficient to destroy any of the organisms tested. At 15 lb. (121°) 65 min. appeared to be the minimum time that could be safely allowed for sterilization of No. 2 cans, 90 min. for No. 2½ cans, and 110 min. for No. 3 cans.

Cold dipping proved much more satisfactory than allowing the cans to cool at room temperature in that the cooking temperature is reduced at once, eliminating the danger of overcooking and at the same time reducing the pressure exerted on the seal.

The authors conclude that "so far as the experiments have been carried, 15 lb. pressure is indicated as necessary for sterility in the laboratory sense. Within that pressure limit the time variable should be made to suit the type of

pack and size of container. In the canning of beef in tins where 15 lb. steam pressure is used over periods of time dependent upon the variation in procedure, the threshold of safety has been reached and probably passed. The term 'safety' as here used refers to freedom from food poisoning by *C. botulinum* and to infectious food poisoning by the *Salmonella* group and allied intestinal organisms. By careful control of still other factors which influence rapidity of heat distribution in the can, such as fluid and fat, it would undoubtedly be possible to process meat just under the threshold of safety and still have a product that would keep for a reasonable length of time."

The composition and nutritive value of fish preserved by cold storage, L. H. ALMY (*Diss., Columbia Univ., New York, 1938, pp. 31*).—Data are presented on the edible portion of mackerel analyzed in the fresh state and at intervals from 4½ to 9½ mo. after being frozen. Chemical analyses included the usual determinations of proximate constituents, together with those of ammonia in the flesh, nitrogen partition, and fat constants and total phosphoric acid of the fat extracted from the flesh. Chemical and bacteriological examinations were made of the fresh and storage mackerel during decomposition at ice box temperature, and comparative organoleptic tests were also carried out on the two kinds of fish. After several months' storage in the frozen condition, there was a slight increase in water-soluble and coagulable nitrogen, thus indicating a slight change in the solubility of the proteins. It is believed that this was due to the action of tissue enzymes. A doubtful increase in the acidity of the water extract of the flesh occurred near the close of the 9½-mo. storage, and a slight increase in the acidity of the fat was also noted with increasing storage periods. These changes may be indicative of a partial splitting up of nucleoproteins, with release of free phosphoric acid and the liberation of free fatty acids through partial hydrolysis. Fresh mackerel increased 1,075 percent in fatty acids and 294 percent in ammonia, whereas frozen mackerel after thawing increased but 30 and 37 percent in these two constituents, respectively, during 5 days' storage at ice box temperature. These results point to more rapid decomposition in the fresh mackerel.

Bacteriological examination of fresh and frozen mackerel and of fresh butterfish, croaker, weakfish, sea bass, and flounder showed that the bacteria in fresh and frozen fish increased in about the same proportion during several days' holding at ice box temperature. The taste of mackerel which had been stored for over 10 mo. at freezer temperatures (−5° to +5° F.) was not sufficiently altered to be objectionable or even detectable. "The conclusion to be arrived at from the entire investigation is that mackerel may be kept in the frozen condition for 10 mo. without affecting their food value or sanitary condition, and without imparting to them an altered flavor recognizable by the ordinary consumer."

Nutritional effects of the addition of meat and green vegetable to a wheat-and-milk diet: Experiments with rats, H. L. CAMPBELL and H. C. SHERMAN (*Jour. Nutr., 16 (1938), No. 6, pp. 603–612, fig. 1*).—Rats (70 males and 103 females) on a diet of ground whole wheat 65.8 percent, whole milk powder 32.9, and NaCl 1.3 percent were observed through complete life cycles in comparison with other rats (69 males and 105 females) receiving the same basal diet supplemented with 5 gm. of raw lean beef and 5 gm. of green beans on alternate days, the ratio of dry diet to meat and beans being approximately 5.5–6 : 1 : 1. "The addition of fresh meat and green beans was found to result in more rapid early growth, attainment and maintenance of larger adult size, and earlier maturity. It also prolonged very slightly the period of adult vitality as measured by the ability of the females to bear young. It did not significantly influence the length of life."

The effect of bananas on laxation, P. L. Harris and G. L. Poland (*Jour. Lab. and Clin. Med., 24 (1939), No. 6, pp. 580–582*).—Male albino rats 90–100 days of age and representing eight different litters served as test animals, and laxation rate (number of fecal units per day), weight of feces, and water content of feces served as criteria for determining the degree of laxation. Data were secured during a 14-day control period on the colony diet (⅔ wheat, ⅓ whole milk powder, and 1 percent salt) and at two periods during which the animals received daily supplements of 20 gm. of banana pulp, partially ripe fruit (yellow peel with green tip) being used in the one period and fully ripe fruit (yellow peel with brown flecks) being used in the second test. The two banana periods and an intervening period on the basal diet were each of 14 days' duration. The results indicate that the fully ripe bananas are more laxative than the partially ripe fruit, that free banana pectin and bound tannin may prove to be the principal laxation factors of the banana, and that there is apparently a sustained increase in laxative effect due to banana feeding in the rat. It is suggested that this effect may also occur in human subjects.

Some problems in attaining adequate nutrition, P. E. Howe. (U. S. D. A.). (*Jour. Wash. Acad. Sci., 29 (1939), No. 9, pp. 357–368*).—The psychological aspects of food selection received particular attention in this presidential address before the Washington Academy of Sciences. "The average person can hardly expect to keep well-informed about all the changes in and additions to knowledge of man's food requirements, but he should realize the extent to which his food habits play a part in determining his well-being. He should also realize that these are not infallible guides, and that a nutritionally abundant and reasonably satisfactory diet can be achieved at different income levels if one is willing to bring an open mind to its acceptance. If the housewife, steward, or cook can combine this knowledge with skill in the selection and preparation of food, real progress toward better nutrition can be made. Thus man can satisfy his body requirements for food without losing the opportunities to enjoy it."

Theoretical and actual caloric requirements, I. M. Rabinowitch (*Jour. Nutr., 16 (1938), No. 6, pp. 549–564, fig. 1*).—Five hundred diabetic patients observed over an average period of 3½ yr. were found to maintain bodily equilibrium with diets having caloric values much below the generally accepted standards. Moreover, the average loss of weight with these diets was very much less than expected theoretically. It is shown that the reduction of basal metabolism to its lowest level, complete absence of specific dynamic action of fat, maximum muscular efficiency, and lightness of work, all operating as conditions favoring the discrepancy, would not entirely account for the appreciable difference between actual and theoretically expected loss of weight. Since the diets resulted in an improvement rather than an impairment in health, it is assumed that the body is very efficient, wasting but very little of the potential energy of the food, or that with underfeeding the body has available some unrecognized source of energy, possibly energy ordinarily wasted as heat.

[First report of the Economic Advisory Council Committee on Nutrition in the Colonial Empire].—I, Nutrition in the Colonial Empire; II, Summary of information regarding nutrition in the Colonial Empire, Earl De La Warr et al. (*[Gt. Brit.] Econ. Advisory Council, Com. Nutr. Colon. Empire Rpt., 1 (1939), pts. 1, pp. 210; 2, pp. IV+146*).—The report of this committee, appointed by the Prime Minister in October 1936, is formulated from replies of the colonial governors to a circular concerning the standards of nutrition in their 48 respective territories. These replies are assembled and summarized in part 2 of the report, part 1 being devoted to the conclusions concerning the state

of nutrition of the native population (over 55 million), representing countless groups having most different food habits and customs.

The first section of part 1 presents the general principles for correct nutrition and discusses how far existing colonial diets differ from these principles and the effect of these differences. The second section discusses various means for effecting improvement, giving special consideration to the adaptation of agricultural policy to nutritional needs; introduction of new crops; expansion of the consumption of products of animal origin, including milk and milk products, and fish; adoption of more satisfactory methods of harvesting, preserving, storing, processing, and cooking foods; purchase of supplementary foodstuffs; attention to the nutrition of paid laborers; education of the officials in the importance of nutrition problems and of the native population in the principles of better nutrition; prenatal services and infant welfare work; and general cooperation and interchange of information between government departments. The report is given in detail, the conclusions being conveniently summarized in a final section (pp. 151–169).

The second part of the report summarizes by colonies the factual information submitted. Some of this material has appeared in individual reports published by the colonial dependencies, and such reports are listed.

Food consumption habits in China, H. LINDSTEDT (*Internatl. Rev. Agr. [Roma], 30 (1939), No. 8, pp. 363E–389E*).—This survey deals with Chinese food consumption habits as shown by recent family budget investigations. From the information obtained, calculations are made as to the intake of energy and the various food constituents, and consideration is given to the importance of the various foodstuffs. On the basis of these findings suggestions are made for improving the Chinese food consumption. It is pointed out that there is probably small possibility of increasing the consumption of animal foodstuffs in the near future, and that the most useful way of improving the quality of the diet lies in increased production and consumption of vegetable foodstuffs.

Food consumption habits in the Far East, H. LINDSTEDT (*Internatl. Inst. Agr. [Roma], Mo. Bul. Agr. Econ. and Sociol., 29 (1938), No. 9, pp. 399E–413E*).—As a general indication of the prevailing food consumption habits in the Far East, data from a number of sources have been tabulated on the intakes per day per consumption unit of various food constituents in China, Japan, Chosen (Korea), Java, Burma, and British India among various classes and in different districts. These data are compared with prevailing dietary habits in the western countries. Tables are also given of the percentage distribution of energy among different foodstuffs and the annual consumption of the principal foodstuffs in the Far East, and these are compared with western consumption.

Data on the growth of public school children (from the materials of the Harvard growth study), W. F. DEARBORN, J. W. M. ROTHNEY, and F. K. SHUTTLEWORTH (*Natl. Res. Council, Soc. Res. Child Devlpmt. Monog., 3 (1938), No. 1, pp. [3]+136*).—This monograph gives the details of repeated physical and mental measurements made on 747 boys and 806 girls selected for completeness of data from records made during a 12-yr. period in the public schools of three cities in the vicinity of Boston. During the first year the tests were made on approximately 3,500 children in the first grade and in succeeding years were repeated on as many of these children as possible. The reported data include 13 sets of annual measurements for 47 boys and 27 girls and 11 or more sets for 637 boys and 588 girls. The ages of the subjects at the time of initial measurements ranged from 5.22 to 12.46 yr. and at the final measurements from 11.11 to 21.54 yr. The average initial ages were 6.93 yr. for the boys and 6.92 yr. for the girls and the final ages 17.51 and 17.30 yr., respectively. The

tabulated data for the individual subjects are prefaced by explanatory sections and an annotated bibliography of the most significant published and unpublished reports on the material of the study.

"The measurements here presented have several advantages over the materials available from previous longitudinal studies of growth, among which are (1) the increased reliability of the physical measurements due to the averaging out of personal errors of measurement, (2) the presentation of the raw figures for the convenience of workers who wish to set up and investigate their own indices and to use preferred methods for determining statistical constants, (3) the opportunity to select groups from a large representative population for particular types of studies, (4) the possibility of investigating idiosyncracies of individual development over a period of years, and (5) the study of particular problems which the selected materials make possible."

Metabolism of normal pre-school children.—III, Variations in nitrogen storage on constant diets, T. PORTER. (Mich. State Col.). (*Jour. Amer. Dietet. Assoc., 15 (1939), No. 6, pp. 427–434*).—This report, dealing with 43 nitrogen balance studies on 3 normal children from 2½ to 5½ yr. of age, completes the series concerning storage variations on constant diets (E. S. R., 70, p. 559). The food intakes of the 3 children on the 3-day meal schedule, which was repeated successfully throughout the study, are tabulated, and the daily individual nitrogen intakes, excretions (urine and feces), and calculated retentions are recorded. The average daily protein (N×6.25) consumptions varied from 2.12 gm. per kilogram of body weight for the oldest child to 2.68 gm. per kilogram for the youngest. These quantities of protein furnished approximately 12 percent of the total energy value of the diets. The average daily nitrogen intakes reported for the subjects in descending age order were 7.94, 6.66, and 6.42 gm., and the nitrogen storage for the subjects in this same order averaged 1.26, 1.14, and 1.30 gm. per day.

The retentions of nitrogen in the 2 longer series of successive balances varied rather widely. An inspection of the results and an analysis to determine the number of consecutive 3-day periods required to give average retentions falling within the range of ±4 P. E. of the mean indicated that it required from 4 to 6 successive balances, or from 12 to 18 days, to cover the entire range of variation in these retentions.

The mineral metabolism of normal infants, G. STEARNS (*Physiol. Rev., 19 (1939), No. 3, pp. 415–438, figs. 2*).—Calcium, phosphorus, and magnesium as structural elements deposited chiefly in the skeleton, chlorine (as chloride), sodium and potassium as electrolytes of the body fluids, and sulfur, iron, copper, cobalt, and iodine, associated with the metabolism of special tissues, are considered in some detail. In conclusion, it is pointed out that "neither the minimal nor the optimal requirements of the infant are definitely known. Study of the mineral metabolism indicates that a surprisingly wide range of body composition seems to be compatible with health during the period of infancy." The selected reference list cites only recent well-documented publications.

Blood sugar changes in the rat produced by salts of beryllium, magnesium, and zinc, with some observations on hemoglobin and red blood corpuscles, W. R. SUTTON and V. E. NELSON. (Iowa State Col.). (*Iowa Acad. Sci. Proc., 45 (1938), pp. 115–121*).—Zinc chloride in 1- to 2-cc. portions and in concentrations representing 30–50 mg. of zinc, zinc sulfate in 1-cc. portions containing 65 mg. of zinc, and beryllium sulfate in 1- to 2-cc. portions representing 6–9 mg. of beryllium were administered by stomach tube to young rats under nembutal anesthesia. The zinc salts caused an increase in hemoglobin content and red blood cell count and an increase in the blood sugar, the rise in 3 hr. being

100–130 percent above the fasting sugar level; if given simultaneously with glucose (250 mg.), the increase was 150–190 percent above the normal fasting level. Control experiments indicated that nembutal anesthesia caused a lowering of the blood sugar and that sulfate ions as sodium sulfate had no effect on the blood sugar. The beryllium sulfate also caused an increase in the blood sugar, although the rise was not as rapid nor as marked as that produced by the zinc sulfate.

Calcium chloride (5–7.5 mg. in 1–1.5 cc.) injected simultaneously with the zinc sulfate prevented the rise in blood sugar without affecting the rise in hemoglobin and red blood corpuscles caused by the zinc sulfate. This effect was not attained if the calcium chloride was given 1 hr. before or after the zinc sulfate administration. The calcium chloride alone did not influence the hemoglobin or red blood cell values, nor did it have any effect on the blood sugar during the normal rise accompanying glucose absorption.

Magnesium sulfate had no effect on blood sugar when given by mouth, but when injected subcutaneously it produced anesthesia and a rise in blood sugar, although the latter effect could be inhibited by calcium chloride or nembutal. Sulfuric acid (1 cc. of 2 N) caused hyperglycemia and an increase in hemoglobin and red blood cells when administered by stomach tube to rats fasted for 20 hr.

The effect upon hematopoiesis of variations in the dietary levels of calcium, phosphorus, iron, and vitamin D, H. G. Day and H. J. Stein (*Jour. Nutr., 16 (1938), No. 6, pp. 525–540, figs. 2*).—Ten groups of young rats, carefully selected as to sex and weight of animal, were placed on a basal diet markedly deficient in calcium, moderately low in iron, sodium, potassium, magnesium, and chloride, and comparatively high in phosphorus, the feeding being so controlled that the caloric intake was the same for each animal. One group was continued as a control, while the others received various mineral supplements of calcium in the form of its carbonate or its phosphate, of iron in the form of its chloride or its phosphate, of beryllium in the form of its carbonate, and of a salt mixture satisfactory as to the relationship of calcium, phosphorus, and iron. Without mineral supplements there was a polycythemia and mild anemia, which became increasingly abnormal as the deficiency progressed. Supplementation with 1.4 mg. of iron as ferric chloride per rat daily only partially prevented this condition, although normal blood values were obtained with 6 mg. of iron as ferric chloride or with 50 mg. of calcium as calcium carbonate, or with 0.9 mg. of beryllium as beryllium carbonate. Neither the 6 mg. of iron nor the 50 mg. of calcium, when fed as the respective phosphates ($FePO_4.4H_2O$ and $CaHPO_4$) were thus effective. The animals receiving the salt mixture gave a normal blood picture, indicating that caloric restriction alone has no significant effect on blood formation. The experiments indicate that anemia and mild polycythemia occurring on a low-mineral ration containing an excess of phosphorus are due to the excess of phosphorus and that calcium is effective in preventing the abnormality because of its ability to bind the phosphorus, thus permitting the dietary iron to be used for hematopoiesis instead of being excreted. Other cations (Fe^{+++} and Be^{++}), if present in sufficient amounts to bind the excess phosphorus, are similarly effective. In a second series of experiments in which the calcium, phosphorus, iron, and vitamin D in the ration were varied, it was demonstrated that the absence of vitamin D from the low-calcium normal-phosphorus ration, with normal and low levels of iron, caused a greater degree of polycythemia and anemia than similar diets containing vitamin D.

The hemopoietic action of cobalt on the course of anemia produced in the young growing rat [trans. title], M. Polonovski and S. Briskas (*Compt. Rend. Soc. Biol. [Paris], 130 (1939), No. 14, pp. 1588–1590*).—Young rats made

anemic by continuance on a milk diet for 30 days were then given a daily supplement of 1–2 mg. of cobalt chloride for a period of 21 days. During this period the hemoglobin rose from 60 to 75 percent and the red cell count from 4.68 to 7.3 millions. At the same time the animals suffered a mild diarrhea and loss of weight and vitality. The authors question, therefore, whether the cobalt exercises a true hemopoietic action or whether the observed effect was merely a consequence of a disturbance produced in the water metabolism of the animal.

Iron administration and haemoglobin levels during pregnancy, E. M. Widdowson (*Lancet* [*London*], *1939, II, No. 12, pp. 640–642, figs. 3*).—The subjects of this investigation of the hemoglobin levels of pregnant women, before, during, and after periods of iron medication were 100 women attending the antenatal clinic of a London hospital. Hemoglobin determinations, by the Haldane method, were first made on these women not later than the twentieth week of pregnancy and were repeated a month later, after which half of the women were given 1,000 mg. of iron as ferric ammonium citrate or reduced iron daily for 6 weeks, while the other half served as controls with no iron treatment. The levels of capillary blood hemoglobin were determined at fortnightly intervals for the first group and at monthly intervals for the second until delivery. In both groups estimations were also made immediately after delivery and 1 week later. At the end of the experiment data were available for 31 women in the iron group and 44 in the control group.

In the control series, the hemoglobin in a few instances did not fall with the progress of pregnancy, in a very few cases rose slowly, and in the majority of cases fell steadily throughout pregnancy and rose sharply after delivery. In the experimental series a few of the hemoglobin values continued to fall, as in most of the control group, several showed a break in the fall but no real increase during the 6 weeks of medication, and most of them rose, although not consistently. In nearly all of the cases the hemoglobin values fell as soon as the iron medication was stopped, and the fall was not checked until after delivery. In the average curves for the experimental and control groups the principal difference was the break in fall of hemoglobin in the experimental group during the period of iron medication, the curves otherwise running practically parallel.

In discussing the significance of these observations, the author gives the following tentative explanation for the increase in hemoglobin values during the period of iron medication: "One of the many factors regulating the level of hemoglobin in the circulation is the amount of iron in the plasma. The more there is, the more active the marrow cells become. When iron is not being administered, the amount of iron in the plasma is maintained at a low constant level by the high capacity of the storage organs. The administration of iron, however, temporarily raises the plasma iron, which stimulates the marrow to greater activity." Concerning the rapid decrease in hemoglobin after the iron medication had been stopped, the suggestion is made that it might reasonably be held that no pathological state had been disclosed which would warrant medication, but that against this view must be set the weight of clinical opinion, which definitely favors raising the hemoglobin of babies and pregnant women. "If it is impossible to achieve normal hemoglobins in babies and pregnant women by physiological means—i. e., without giving them therapeutic doses of iron—and if perfect health requires a normal hemoglobin, clearly it is advisable to interfere with physiological processes in the best interests of the subject."

The utilization of calcium, F. F. Tisdall and T. G. H. Drake (*Jour. Nutr., 16 (1938), No. 6, pp. 613–620, fig. 1*).—The calcium and phosphorus content of the bodies (with intestines discarded) of young rats on a normal stock diet averaged 430 and 287 mg., respectively, at 3 weeks of age and 1,406 and 780 mg. at 7 weeks. Matched groups of animals maintained from the third to the seventh week on low-calcium diets contained, however, appreciably less calcium and phosphorus than the normal controls, the calcium and phosphorus body contents being 968 and 592 mg., respectively, on the Fincke and Sherman low-calcium diet and 482 and 392 mg., respectively, on the Robertson low-calcium diet. The latter, chosen as a basic low-calcium diet sensitive to calcium additions, was fed to matched groups of animals receiving additions of 0.2 percent calcium in the form of the carbonate, chloride, phosphate, gluconate, and lactate, and as whole milk powder, casec, and Pablum, respectively. In these various cases the percentage of added calcium retained varied from 72.9 to 77.6. Extra phosphorus was also retained in these experiments, the retention of calcium and phosphorus being in the ratio of 2:1. The addition of calcium in the form of large amounts of spinach resulted in a reduction rather than an increase in the body calcium, this effect probably being due to the oxalic acid content of the spinach. An average human diet low in milk was found inadequate as a source of calcium when fed to rats. Not only was the calcium retention on this diet low, but the percentage of calcium retained was less than in the same diet with added milk.

Variation of weight of dry feces in short period experiments with a low residue-neutral ash diet, I. M. Rabinowitch and A. F. Fowler (*Jour. Nutr., 16 (1938), No. 6, pp. 565–569*).—The weight of dry feces per day on a constant low residue-neutral ash diet was found remarkably constant in a series of 20 experimental periods ranging from 3 to 20 days, involving 11 different subjects and 8 different clinical conditions. The average dry weight of feces was 21.5 gm., with a standard deviation of 2.1 and a probable error of the mean of 0.31. It is suggested that this diet (bread 420 gm., butter 85, eggs 200, milk 1,680, and orange juice 200 gm.) might be useful not only in mineral balance experiments but also in studies of fecal weights in general.

Effects of prolonged use of extremely low-fat diet on an adult human subject, W. R. Brown, A. E. Hansen, G. O. Burr, and I. McQuarrie (Univ. Minn.). (*Jour. Nutr., 16 (1938), No. 6, pp. 511–524*).—An adult human subject was maintained on a supplemented skim milk-sugar type of diet furnishing less than 0.03 gm. of fat per kilogram of body weight per day for a period of 6 mo. without demonstrable harm. Young rats placed on the same diet developed the typical fat-deficiency syndrome.

A gradual loss of weight (from 69 to 62 kg.) in the first 3 mo. and a coincident reduction to normal of a slightly elevated arterial blood pressure were observed in the human subject, who reported disappearance of recurrent attacks of migrainelike headache from which he had suffered for some years prior to the experiment and disappearance of the previously experienced feeling of fatigue at the end of the day's work. On the low-fat regime the respiratory quotient after a large meal rose to a maximum of 1.14 as compared with previous values of 0.97 and 0.99; the basal metabolic rate in the sixth month was −2 percent as compared with values between −9 and −12 percent obtained before and after the experimental period; the iodine number of the total fatty acids of the serum from fasting blood specimens decreased from 123 to 93, indicating a decrease in the degree of unsaturation of the serum lipids; and coincident with the latter phenomenon the linoleic acid content of the serum fell from 5.7 to 3.2 percent of the total fatty acids, and arachidonic acid decreased from 3.2 to 1.8 percent.

The increase in respiratory quotient and the changes in serum fatty acids are responses similar to those exhibited by rats on a diet deficient in unsaturated fatty acids. Apparently the adult human, like the rat, is unable to synthesize the highly unsaturated fatty acids. It cannot be assumed, therefore, that the human subject could subsist indefinitely on a diet completely devoid of the unsaturated fatty acids.

[**Symposium on vitamins, with special reference to therapy**] (*Bul. N. Y. Acad. Med., 2. ser., 15 (1939), Nos. 6, pp. 406–417; 7, pp. 469–478; 8, pp. 544–552*).—At this symposium, held at the New York Academy of Medicine, February 2, 1939, the following papers were presented: Vitamin A With Special Reference to Therapy, by A. M. Yudkin; The Diagnosis, Treatment, and Prevention of Vitamin B_1 Deficiency, by N. Jolliffe; and The Therapeutic Use of Vitamin C, by G. Dalldorf.

Vitamins and hormones and their technical production, I–III, edited by H. Carlsohn (*Vitamine und Hormone und ihre technische Darstellung. I. Teil, Ergebnisse der Vitamin- und Hormonforschung; II, Darstellung von Vitaminpräparaten; III, Darstellung von Hormonpräparaten. Leipzig: S. Hirzel, 1936, vols. 1, pp. XI+101; 2, 1939, pp. XI+205; 3, 1938, pp. XI+[1]+162, fig. 1*).—In the first volume of this series, by H. Bredereck, particular attention is given to recent scientific investigations of vitamins and hormones. For vitamins A, B_1 (aneurin), B_2 (lactoflavin), C (ascorbic acid), D, and E, information is summarized briefly concerning their action, detection and determination, occurrence, composition and constitution, and where pertinent provitamins, synthesis, and toxic action are also considered. Other members of the vitamin B complex, vitamin C_2 (nutritional factor J), vitamin H, and vitamin K are mentioned briefly. In the section on hormones information is summarized concerning the isolation, composition, synthesis, and specificity of the various male and female hormones, insulin, adrenaline, and thyroxine. Cortin, parathromone, and hormones of the hypophysis, thymus, heart, liver, and intestinal mucosa are mentioned briefly. In the field of plant hormones auxin and heteroauxin are discussed. The volume includes a selected bibliography and a subject index.

Volume 2, by F. Seitz, deals with the various fat-soluble and water-soluble vitamins, presents for each vitamin a summary covering such points as nomenclature, standards, chemical relations and constitution, occurrence, preparation either from naturally occurring products or by synthesis, literature citations, and a list of patents. Special considerations pertinent to the particular vitamins are also discussed. Sections are devoted to vitamin-containing medicaments, dietetic products, foods and condiments, and cosmetics. Commercial vitamin preparations (German and foreign) are listed by their trade names, with notes as to the manufacturing firm, the nature of the preparation, and the unitage. Patent, subject, and author indexes are appended.

The third volume, by E. Vincke, deals with hormones exclusive of the sexual hormones, presenting first a section on general procedures, such as preservation of material and preparation and purification of extracts. Individual hormones are then reviewed in detail, consideration being given to their chemistry, their determination and evaluation, and the methods of preparation. Extensive literature citations and a list of patents are given in the case of each hormone, and the commercial preparations available are listed by trade names, with notations as to the manufacturing firms and the nature and strength of the preparations. Insulin, thyroxine, parathormone, adrenaline, preparations from the adrenal cortex and from the anterior and posterior lobes of the hypophysis, and in addition certain physiologically active substances (not true hormones) are considered. Patent, subject, and author indexes are appended.

The vitamin B complex in practical nutrition, C. A. ELVEHJEM. (Univ. Wis.). (*Jour. Amer. Dietet. Assoc., 15 (1939), No. 1, pp. 6–12*).—An address.

New investigations on vitamin B factors [trans. title], H. v. EULER, M. MALBERG, and F. SCHLENK (*Arkiv Kemi, Min. och Geol., 13A (1939), No. 2, Art. 10, pp. 8*).—The authors describe in detail their various attempts at preparing from vitamin B_1-active yeast extracts, filtrates free from nicotinic acid amide and its derivatives, in order to study these substances in curative tests. The preparation of such a filtrate, containing the B complex freed only from nicotinic acid amide and its derivatives (particularly cozymase), was not successfully accomplished, however, either by fuller's earth or charcoal adsorption or by butanol extraction. By these procedures some further component of the B complex was separated along with the amide and the derivatives, and the resulting filtrate, therefore, was not restored to a complete vitamin B complex through the addition of cozymase alone.

From the feeding tests the authors consider that they obtained some evidence of the significance of nicotinic acid amide for the rat, since the rat body was apparently impoverished in this factor during B-avitaminosis but was brought back to normal after the addition of boiled extract of yeast.

Studies on vitamin B_1 metabolism [*trans. title*], G. GUHE (*Klin. Wchnschr., 18 (1939), No. 24, pp. 854–856*).—Vitamin B_1 was determined by a modification of the Jansen thiochrome method in the urine of a number of normal individuals and hospital cases receiving the routine hospital diet, which was admittedly somewhat low in vitamin B_1. In the case of the normal adults on this diet, the 24-hr. urinary elimination varied from 17γ to 72γ. Patients given 10-mg. injections of the vitamin eliminated from 16.5 to 33.5 percent of the injected dose within the 24-hr. period following the injection, the greatest amount being eliminated within the first 2 or 3 hr. The daily excretion of a number of pregnant women varied from 9.6γ to 86.4γ. One subject, however, had been receiving a diet containing whole grain bread, and in her case the daily excretion varied from 78.4γ to 124γ. After a 5-day period in which white bread was substituted for the black bread the amount of the vitamin eliminated in a 24-hr. period dropped to 48γ. The authors report further that symptoms of vitamin B_1 deficiency were seldom observed in pregnant women who were accustomed to diets containing black bread.

The metabolism of vitamin B_1 in health and disease [trans. title], H. SCHROEDER (*Klin. Wchnschr., 18 (1939), No. 5, pp. 148–150, figs. 2*).—The urinary elimination of vitamin B_1 was determined by a thiochrome method for normal adults and for adults suffering various diseased conditions. Values of 100γ–400γ, the majority coming within the range of 100γ–200γ, were obtained for the daily elimination of the vitamin in the case of normal individuals. In the diseased group, however, the urinary elimination of vitamin B_1 was very low or even negligible, indicating that in conditions of fever or of deranged resorption a vitamin B_1 deficiency exists. Within 24 hr. after intravenous injection of 5–10 mg. of aneurin, normal individuals excreted 3,000γ–9,000γ of the vitamin, whereas the pathological cases eliminated 18γ–6,160γ except in one case where an elimination of 13,120γ was attained on 1 day. Although the elimination was erratic, in general, the greater the injected dose the smaller the percentage eliminated.

Tests to determine the fate of the vitamin in the gastrointestinal tract showed that it could not be found in the gastric juice. This destruction of the vitamin is attributed to the presence of hemin rather than to the action of the gastric juice itself. Another phase of the study involved the daily feeding of large quantities (250 gm.) of pure dextrose to each of two adults over a period of 14 days. In both cases the urinary excretion of vitamin B_1 was reduced to negligible quantities.

Excretion of injected aneurin (vitamin B_1), J. Marrack and H. G. Hollering (*Lancet* [*London*], *1939, I, No. 6, pp. 325, 326*).—A modification of the Westenbrink and Goudsmit (E. S. R., 81, p. 454) thiochrome method for determining vitamin B_1 is described in some detail. The modification, which does not require the use of a fluorimeter, is considered to be of sufficient accuracy for clinical estimation of aneurin excreted in the urine. The elimination of injected aneurin was determined by this method in the case of 10 normal adults, 6 of whom were also studied in control periods when no aneurin was administered. In the test period one of the subjects received an injection of 10 mg. of aneurin and the others each received 3 mg. The amount of the vitamin excreted in the urine was determined at 3-hr. intervals after the injection. It was found that the excretion was rapid in the first 3 hr., and that the amount excreted in the second 3-hr. period was only slightly in excess of the amount passed in control periods. Even in the first 3-hr. period there was variation in the elimination response, from 4 to 41 percent of the 3-mg. dose being excreted by various subjects.

Vitamin C content of spinach, C. F. Dunker and C. R. Fellers. (Mass. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 500-504*).—In this study of the relative changes in the vitamin C content of spinach due to cooking, freezing, canning, and drying, semiweekly shipments of iced fresh raw spinach were sent from a commercial freezing plant in New Jersey to the station, and other portions of the same lots were frozen or canned for later shipment. The unfrozen, frozen, and canned samples were tested for vitamin C by indophenol titration, and 1-lb. samples of the fresh and frozen spinach were cooked in water and in steam and the solids and cooking water tested for vitamin C. Several portions were dehydrated and tested, and determinations were also made of reversibly oxidized ascorbic acid in cooked and canned samples. Biological tests by the Sherman method were made on a few samples of fresh raw, fresh cooked, and canned reheated spinach.

As determined by indophenol titration, the samples of raw spinach ranged in vitamin C content from 58.3 to 114.2 mg. per 100 gm., or from 331 to 647 International Units per ounce. Average values for 10 lots of spinach subjected to various treatments were raw 84.4 mg. per 100 gm., steam cooked 56.3, water cooked 27.6, frozen 46.9, frozen cooked with water 28.5, and canned 27.5 mg. Corresponding values in terms of International Units were 478, 320, 156, 266, 161, and 156 I. U. per ounce. From the limited number of feeding tests with guinea pigs, estimated values were fresh 407, fresh cooked 204, and canned 113 I. U. per ounce. Much of the apparent loss in vitamin C on cooking was due to the solution of the vitamin in the cooking water, which was found to contain from 10 to 30 percent of the original vitamin, depending upon the amount of the cooking water. Dehydration of the spinach resulted in total loss of the vitamin. No dehydroascorbic acid was found in either frozen or canned spinach.

The intradermal test for vitamin C determinations, I. S. Wright and E. MacLenathen (*Jour. Lab. and Clin. Med., 24 (1939), No. 8, pp. 806, 807*).—The test, involving intradermal injection of 2,6-dichlorophenolindophenol (E. S. R., 78, p. 571; 80, p. 566), was applied to patients for whom information was available as to dietary history and blood values for vitamin C. It was found that certain patients showing marked vitamin deficiency by these latter criteria gave values falling within the normal set for the decolorization test, and that other patients judged as normal gave values above those proposed as normal in the decolorization test. Variations in the decolorization time were found too great to set up a normal range, and in addition readings taken at one site frequently varied considerably from those at either a close or a distant site. The

authors consider, therefore, that the 2,6-dichlorophenolindophenol injection test is not a reliable guide in determination of the general status of the body vitamin C nutrition.

The determination of vitamin C in children by intradermal injection, H. G. RAPAPORT and S. H. MILLER (*Jour. Ped., 15 (1939), No. 4, pp. 503–507*).—In comparisons on 100 children of the ascorbic acid content of the blood plasma, as determined by the Farmer and Abt method, and the decolorization time in minutes of intradermally injected dichlorophenolindophenol, following the method suggested by Rotter (E. S. R., 78, p. 571), the authors found insufficient correlation between the two tests to warrant the use of the Rotter test for clinical purposes. In the group with blood values indicating normal or high vitamin C content, comprising 53 percent of the entire number, the Rotter test gave a fair indication of saturation, but in the unsaturated group it failed to give accurate information concerning the degree of vitamin C deficiency.

A test for the determination of the vitamin C storage: Vitamin C index, L. KAJDI, J. LIGHT, and C. KAJDI (*Jour. Ped., 15 (1939), No. 2, pp. 197–218, figs. 4*).—Following a review and discussion of the various methods which have been suggested for determining the status of vitamin C nutrition, data are presented showing the applicability to infants of parenteral tolerance tests in which the plasma ascorbic acid is determined before and 4 hr. after the intramuscular injection of 200 mg. of ascorbic acid dissolved in 5–8 cc. of saline. Values below 0.2 mg. per 100 cc. are considered to indicate scurvy and below 0.6 mg. per 100 cc. serious depletion of the reserves. In the opinion of the authors a more sensitive criterion in the same test is a vitamin C index representing the product of the initial ascorbic acid value and the increase 4 hr. after the injection multiplied by 100. The basis of the index is explained as follows:

"The plasma level is determined by the intake, the rate of withdrawal from, or deposition into the stores, the rate of excretion, and the rate of utilization. Since the rate of excretion is probably dependent on the plasma level, it is not an independent factor. The low plasma level, therefore, may depend on ingestion of inadequate amounts, low stores, increased destruction, or utilization. If the inadequate ingestion or increased destruction is of short duration, then the storage may not be greatly interfered with, although the plasma level is low. In such a case the increase in the plasma vitamin C following the injection of the test dose may be normal or even greater than normal, hence the combination of the initial plasma level and the increase 4 hr. after injection will give a better idea of the state of the stores then either alone."

Although the subjects in the present study (44 children, 37 of whom were under 2 yr. of age) are considered too few to establish rigid limits for this index, a value below 0.8 is thought to indicate clinical scurvy, values between 0.8 and 6 very deficient reserves, and considerably above 10 normality.

The results of comparative ascorbic acid determinations in blood and urine [trans. title], FALKE (*Klin. Wchnschr., 18 (1939), No. 24, pp. 842–844, figs. 7*).—The relation of blood level to urinary elimination under various conditions of administering the ascorbic acid dosage is discussed, and the findings are presented in a series of curves. In persons not in a state of vitamin C saturation daily oral administration of 300 mg. of ascorbic acid caused a slow increase in the fasting blood level, the daily increment being about 0.15–0.2 mg. No increase in the urinary excretion was noted till the fasting blood level had reached 1 mg. percent, and the excretion did not become really pronounced till the level of 1.6–1.8 mg. percent had been attained. The more these critical limits were exceeded the greater was the urinary elimination. After saturation

was reached, continued daily dosage (300 mg. orally) gave a fairly constant elimination response of about 210–240 mg. per 24 hr. and a morning (fasting) blood level of about 1.3 mg. percent.

Variation in the water intake was found to affect the rate of urinary elimination, but to have no effect on the total amount eliminated in 24 hr. Hourly determination of ascorbic acid in the urine indicated that the amount eliminated paralleled the urinary specific gravity.

Excretion of vitamin C in the sweat, I. S. Wright and E. MacLenathen (*Jour. Lab. and Clin. Med., 24 (1939), No. 8, pp. 804, 805*).—In 70 determinations on samples of perspiration obtained from 20 patients during periods of excessive sweating, the ascorbic acid content was found to vary from 0.024 to 0.186 mg. percent. These values were not changed significantly following the intravenous injection of large amounts of vitamin C (1 gm. of Cebione). Urinary values determined within the 5-hr. sweating period following the injection were lower than normal. Obviously the low excretion was not due to loss in the perspiration, and it is suggested, therefore, that an increased body metabolism and subsequent increased utilization of ascorbic acid in the tissues occurs in periods of excessive sweating.

The effect of surgical operations on the level of cevitamic acid in the blood plasma, C. C. Lund (*New England Jour. Med., 221 (1939), No. 4, pp. 123–127, figs. 4*).—Plasma cevitamic acid determinations by a modification of the Farmer and Abt method (E. S. R., 74, p. 135) were made before and after major operations on 43 patients. None of them were given cevitamic acid, and for 2 to 3 days after operation their food intake was very small. In nearly every case there was prompt fall after the operation from the original level. In the group having preoperation levels of at least 0.8 mg. per 100 cc., the vitamin level was reduced postoperatively by about 30 percent on the average and not over 50 percent in any individual. In the group having preoperative levels between 0.5 and 0.8 mg. per 100 cc., the drop postoperatively averaged about 50 percent, a few of the patients showing a loss of nearly all the vitamin from the blood. In the groups having low to very low preoperative levels of vitamin in the plasma, this level either persisted or dropped still further after the operation. In a few cases, but not in all, the level began to rise again after 4 or 5 days. The author suggests that the decrease in the plasma vitamin may be accounted for by the demands of the increased metabolism associated with the slight fever which usually persists for 4 or 5 days after any operation or by the demands of newly formed tissues taking part in the healing process.

Ascorbic acid requirements in patients with peptic ulcer, H. A. Warren, M. Pijoan, and E. S. Emery, Jr. (*New England Jour. Med., 220 (1939), No. 26, pp. 1061–1063*).—Saturation studies were carried out on five patients with active duodenal ulcers. These patients had been on vitamin C-deficient diets for periods of from 1 week to 7 yr. preceding admission to the hospital and during the period of study all were on the Sippy diet. For the five patients, respectively, 1.20, 0.91, 1.10, 1.02, and 1.05 mg. of ascorbic acid per kilogram per day were found necessary to maintain tissue saturation.

Failure of treatment with pure ascorbic acid in a typical case of scurvy [trans. title], H. J. Lauber and T. Bersin (*Klin. Wchnschr., 18 (1939), No. 21, p. 753, fig. 1*).—This case report deals with a patient received in an emaciated condition and suffering with full and bleeding blood blisters on the gums, tongue, and palate and with marked hematoses, of the skin and mucous membranes. Intravenous injection of 500 mg. of ascorbic acid and the administration of a diet rich in vitamin C brought immediate but brief response, the patient reverting to the original condition in spite of continued treatment with ascorbic

acid. Excessive bleeding necessitated a blood transfusion, after which the vitamin C administration immediately became effective again. In explanation of the behavior, it is assumed that the protein reserves of the patient were so low as to prevent the formation of the enzyme complex consisting of protein carriers and the vitamin itself. This situation was remedied upon transfusion of new blood to supply the necessary protein.

Critical observations on the vitamin P question [trans. title], I. ROZNIEKS (*Ztschr. Vitaminforsch., 8 (1938–39), No. 1, pp. 27–31; Fr., Eng. abs., p. 31*).—Experience with the various commonly known tests for flavone (vitamin P) indicates that they are not sufficiently sensitive to serve in detecting its presence in minute amounts. Moreover, the tests are not entirely specific, and they may be readily masked by the presence of interfering substances. At present, therefore, it is not possible to detect with certainty the presence of flavone in foods or animal organs, nor is it possible to prepare flavone-free diets for animal studies.

[Symposium on vitamin deficiencies] (*Amer. Jour. Trop. Med., 19 (1939), No. 3, pp. 207–217, 219–227, 229–242*).—In this symposium, held at the 1938 meeting of the American Society of Tropical Medicine at Oklahoma City, Okla., the clinical manifestations of deficiencies in certain of the vitamins, with methods for their detection, prevention, and cure, were discussed in the following papers: Beri-beri and B_1 Hypovitaminosis, by G. C. Shattuck; The Possible Clinical Significance of Factors of the Vitamin B_2 Complex Other Than Nicotinic Acid, by W. J. Dann; and Newer Clinical Aspects of Vitamin Deficiency Diseases—Vitamin A Deficiency, by J. B. Youmans.

The nature of the fatty acids stored by the liver in the fat-deficiency disease of rats, L. C. A. NUNN and I. SMEDLEY-MACLEAN (*Biochem. Jour., 32 (1938), No. 12, pp. 2178–2184*).—At the conclusion of the feeding experiments of the study previously noted (E. S. R., 82, p. 285), an examination was made of the fatty acid content of the livers of 5 selected groups of rats which had served as negative controls and those which had received methyl linoleate, methyl linolenate, linseed oil, and the methyl ester of decosahexenoic acid (from cod-liver oil), respectively. The livers of rats fed on a fat-free diet were found free from acids containing four or more double bonds, but a hitherto unknown acid $C_{20}H_{36}O_2$ was isolated as its hexabromide (m. p. 202°–204° [C.]). Rats receiving very small doses of methyl linoleate after a long time on the fat-free diet contained the same dihydroarachidonic acid as had been found in the negative controls. Arachidonic or some other highly unsaturated acid was also present, and this had probably been synthesized from the linoleic acid given.

Rats that had received the methyl linolenate synthesized an acid which from the bromine content of its bromide might have been a mixture of arachidonic and docosapentenoic acids. Rats dosed with C_{22} hexenoic acid contained the C_{22} pentenoic acid in their livers. Linoleic and linolenic acids appeared to be the building stones essential for the production of more highly unsaturated acids which play some unknown part in enabling the animal to store fat in its depots and tissues.

Pellagra, beriberi, and riboflavin deficiency in human beings, T. D. SPIES, R. W. VILTER, and W. F. ASHE (*Jour. Amer. Med. Assoc., 113 (1939), No. 10, pp. 931–937*).—The typical symptomatology of pellagra, beriberi, and riboflavin deficiency, as observed in the course of dietary, clinical, and laboratory studies on nearly 1,000 clinical cases (Hillman Hospital, Birmingham, Ala.) is described. The general principles of therapy and the specific treatments found successful in these cases are outlined. The nicotinic acid (or its amide or its sodium salt), thiamin hydrochloride, and riboflavin were found specific in the

cure of these three deficiency conditions, respectively, and the results were spectacular. It is emphasized that multiple deficiencies often occur in the same patient, and that in such cases the therapeutic agent specific for each deficiency must be administered. The necessity of adequate medical care is emphasized, and much importance is attached to maintaining the patients on a well balanced and liberal diet, at least one-half of which should consist of lean meat, milk, and eggs.

Pellagra in infancy and childhood, T. D. SPIES, A. A. WALKER, and A. W. WOODS (*Jour. Amer. Med. Assoc., 113 (1939), No. 16, pp. 1481–1483*).—In an area in which pellagra is endemic the disease was found to be quite common among infants and children. Nutritional histories indicated that these children received inadequate diets and that often the mothers, during pregnancy and lactation, had subsisted on diets high in carbohydrate and low in protein, minerals, and vitamins. This inadequate diet of the mother was reflected in the nutrition of the infant.

Lesions characteristic of the disease were seldom seen in infants but frequently appeared in early childhood. In the absence of typical lesions, however, the diagnosis of latent pellagra was confirmed by prompt response to therapeutic agents specific for pellagra. Administration of yeast or nicotinic acid was followed by rapid improvement, and similar response was obtained following administration of the monocarboxylic or dicarboxylic acid of pyrazine. A total daily dosage (administered in divided doses) of from 45 to 60 gm. of brewers' yeast or from 50 to 300 mg. of the other therapeutic agents is recommended.

Pigment excretion in pellagra, A. P. MEIKLEJOHN and R. KARK (*New England Jour. Med., 221 (1939), No. 14, pp. 519–521, fig. 1*).—Quantitative determinations for porphyrin by a method specific for this substance, applied to 24-hr. urine specimens from four cases of endemic pellagra unassociated with alcoholism, showed no increase in porphyrinuria. Positive tests were obtained by a method described earlier by W. Beckh, P. Ellinger, and T. D. Spies, but it was shown that these results were due to the oxidation of ether-soluble indole derivatives in the presence of hydrochloric acid, with the production of pigments giving a characteristic urorosein reaction. It is considered, therefore, that the B. E. S. test is not applicable as a method for detecting the presence of porphyrinlike substances.

The effect of cocarboxylase upon metabolism and neuro-psychiatric phenomena in pellagrins with beriberi, F. H. LEWY, H. E. HIMWICH, J. P. FROSTIG, and T. D. SPIES. (Univs. Pa. and Calif. et al.) (*Science, 90 (1939), No. 2328, p. 141.*)—The eight patients selected were studied repeatedly before and after the administration of cocarboxylase (pyrophosphate of thiamin) to determine its effect on blood metabolites, neurological response, and psychiatric status. The administration of 50 mg. of cocarboxylase to persons who exhibited signs of an "active process" brought about rapid improvement in every case. The bisulfite-binding substances in the blood decreased, the pathological signs of cranial and peripheral nerves, which had been increased by the administration of nicotinic acid and riboflavin, disappeared, muscle irritability and tactile sensibility became normal, and the depressed pupillary and corneal reflexes improved quantitatively.

This study indicates that beriberi accompanying pellagra is a distinct clinical entity and is not caused by a deficiency of nicotinic acid or riboflavin. Moreover, cocarboxylase effects striking improvement in the conditions associated with the beriberi.

Pellagra of Kentucky mountain folk: Ambulatory treatment with nicotinic acid, J. H. Kooser and M. A. Blankenhorn (*Jour. Amer. Med. Assoc., 112 (1939), No. 25, pp. 2581–2584*).—Descriptive matter, including notations on the state of nutrition and on the pellagra-preventing foods contained in the diet, clinical observations, treament, and results are summarized for the 41 ambulatory pellagrins treated in a clinic with nicotinic acid and without change of diet. Of these, 28 were completely cured and remained well, 12 were partially improved, and the condition of 1 who was inadequately treated remained unchanged. Eight of the patients showed significant gains in weight and 14 showed a loss. The dosage used varied according to complaints and objective symptoms. The largest average weekly dose was 2.8 gm. and the smallest 0.24 gm. It is pointed out that nicotinic acid seems to cure pellagra even when poor diets are continued, but relapses may occur. Although the nicotinic acid may aid in the restoration to health, a considerable amount of ill health may still persist among the pellagrins.

Antipellagric properties of quinolinic acid, R. W. Vilter and T. D. Spies (*Lancet [London], 1939, II, No. 8, p. 423*).—A brief report is given of the curative effect of quinolinic acid for human pellagra. Six patients with moderately severe symptoms of pellagra were given 1,000 mg. of the product in divided oral doses over a period of 5 hr., and a seventh patient severely ill with the disease was given 1,000 mg. daily for 3 days. In every case the response was dramatic, and the concentration of coenzymes I and II in the blood increased from the low values found in pellagrins in relapse to normal values 24 hr. after the quinolinic acid had been given.

Dental caries, J. A. Marshall (Univ. Calif.). (*Physiol. Rev., 19 (1939), No. 3, pp. 389–414*).—The present review, based upon the important research since 1924, discusses the current hypotheses concerning the etiology of dental caries in relation to conclusions based upon earlier studies. The etiological factors considered are classified as anatomical, bacteriological, chemical, dietary, endocrine, failure in mouth hygiene, and hereditary. Therapy is considered briefly. In summary it is pointed out that "in spite of the advance in the therapeutics of caries, the etiology remains an enigma," and the author lists some of the questions for which satisfactory answers must be found in solving the puzzle. A selected bibliography is included.

Mottled enamel: The result of a change of water supply at Bauxite, Arkansas: Ten years afterward, F. S. McKay (*Jour. Amer. Dent. Assoc., 26 (1939), No. 6, pp. 900–905, figs. 20*).—An examination of the native children of Bauxite, Ark., made by the U. S. Public Health Service in 1928 (E. S. R., 65, p. 396), showed that 100 percent of them presented mottled enamel, varying in degree up to the most severe type. At that time the municipal water supply, obtained from three deep wells, was found to have a fluorine content of 13.7 p. p. m. When the community changed the supply, obtaining water free from fluorine from the Saline River through a 7-mile pipe line, an examination of the children made in 1938 indicated 100 percent normality of enamel calcified with the use of the new water supply. Children born at and subsequent to the time of the change of water were found to have normal enamel, while children from 1 to 4 or 5 yr. of age at the time of the change were found in the later survey to have incisors, cuspids, and first molars presenting various degrees of damage. These had been calcified during the use of the old water supply. The bicuspids and second molars, on the other hand, were calcified during the use of the new supply and these were found normal or nearly so. In the older children the enamel of all teeth except the third molars were characteristically damaged, the third molars having been the only teeth calcified when the new water supply was in use. Pictures illustrative of these changes are presented.

TEXTILES AND CLOTHING

Physical characteristics in cotton and their interrelationship, M. A. Grimes (*Texas Sta. Rpt. 1938, p. 100*).—This progress report (E. S. R., 81, p. 155) summarizes data on the percentage of mature fibers, the weight per inch, and the breaking strength of the fibers of Lightning Express and Half-and-Half varieties of cotton, the backcross, and the F_1 and F_2 generations.

Judging fabric quality, R. V. Morrison (*U. S. Dept. Agr., Farmers' Bul. 1831 (1939), pp. [2]+22, figs. 13*).—Practical information on modern fabric construction and finish has been assembled, with photographic illustrations, as an aid to the consumer in judging quality. The material includes descriptions, with as far as possible household tests for identification, of cotton, linen, silk, wool and hair, and rayon and synthetic fibers, and fabrics manufactured from them; a discussion of kinds of yarns and of weaves and designs, with their effect on the durability of fabrics; colorfastness; shrinkage control; and special finishes, including finishes for permanent stiffness, crease and crush resistance, water or moisture repellents, prevention of yarn slippage, moth proofing, mildew prevention, fireproofing, and the simulation of linen in cotton fabrics.

A consumer classification and specification for cotton turkish towels, M. B. Hays. (U. S. D. A.). (*Rayon Textile Mo., 19 (1938), No. 4, pp. 85, 86, 112, figs. 4*).—The earlier study of Hays and Elmquist (E. S. R., 76, p. 431) on the physical and chemical qualities of 37 cotton turkish towels has been extended to a total of 74 sold under 12 brands. These include the types designated in the earlier paper as types 1, 2, 3, and 4, depending upon the ply of the ground warp and the ratio of the number of pile yarns, and a fifth type of rib weave. Most of the towels offered on the retail market are of types 1 and 4. Type 3 is frequently selected for institutions. Based on the analysis of these towels, minimum specifications are proposed as a buying guide for types 1 and 4.

HOME MANAGEMENT AND EQUIPMENT

Incomes and expenditures of 299 Vermont village families, M. Huse and M. E. Openshaw (*Vermont Sta. Bul. 450 (1939), pp. 46*).—This report is based on part of the data collected from the six Vermont villages included in the Nation-wide consumer purchase study previously referred to (E. S. R., 81, p. 603). The selected sample included those who had been in the community for 9 or more months of the schedule year and could be classified in one or more of the five arbitrarily established classes of the main investigation. The sample consequently, while representative of certain numerically important population groups, did not adequately represent the entire population of the six villages.

Of the 299 families, 147 were those of wage earners, 56 each of clerical workers, and salaried business and professional, and 40 independent business and professional workers. Their annual net cash incomes ranged from $123 to $4,829, averaging $1,493, with an additional average of $124 worth of goods in the form of food raised or given, housing, clothing, gifts, etc. The cash living expenditures ranged from an average of $455 for families with incomes under $500 to $2,728 for those with incomes ranging from $2,500 to $5,000, with a median for all families of $1,333 and an average of $1,461. At all income levels below $2,000 (including 78 percent of the families) the average cash expenditure for family living exceeded the average cash receipts for the schedule year. The percentage expenditure for food decreased from 48 percent for those of cash incomes under $500 to 25 percent for those receiving $2,500–$5,000, and averaged 30 percent of the total expenditure. The average values for the other items constituting

family living were household operations 14, housing 13, automobile 11, clothing 8, medical care and recreation each 4, furniture and gifts each 3, personal care and tobacco each 2, reading matter, education, taxes, and miscellany each 1 percent.

The differences between the cash income and the living expenditures in many families were due to receipts other than income and disbursements other than those for goods and services. Assets in some instances were decreased by the sale of property and the use for living expenses of the money received. In other cases assets were increased by purchases of property made possible by curtailment of living costs. Increases in proprietorship averaging $249 were reported by 57 percent of all of the families, decreases averaging $261 by 39 percent, and no change by 4 percent. These changes included amounts invested in the home, life insurance annuities, stocks and bonds, business investments, cash in banks, and debts payable.

Outlook for farm family living in 1940 (*U. S. Dept. Agr., Misc. Pub. 377 (1939), pp. [2]+6*).—This report, from the Agricultural Outlook Conference (E. S. R., 80, p. 570), contains a foreword by L. Stanley and a discussion of the outlook for better living among farm families in 1940 under the headings farm family income, 1940; farm family income, 1939 (by regions); planning farm family living, 1940; food for the family; communication and transportation; clothing; and housing, equipment, and household operation.

MISCELLANEOUS

Food and life: Yearbook of Agriculture, 1939 (*U. S. Dept. Agr. Yearbook 1939, pp. XV+1165, figs. 123*).—The fourth of this series of yearbooks (E. S. R., 80, p. 285) contains a foreword by H. A. Wallace, a dedication to W. O. Atwater, a summary article by G. Hambidge (pp. 3–94), and sections on animal nutrition and human nutrition noted on pages 518 and 553 of this issue. A bibliography of 1,278 references is included.

Bimonthly Bulletin, [November 1939] (*North Dakota Sta. Bimo. Bul., 2 (1939), No. 2, pp. 23, figs. 6*).—In addition to an article noted on page 505 and the customary abstracts, this number contains Field Practices and Agricultural Experimentation, by H. L. Walster (p. 2); The Great Plains Traveling Conference, by H. C. Hanson (pp. 3, 4); Distribution of Rival and Pilot Wheats, by T. E. Stoa (pp. 4–6); The Leguminous Plants of North Dakota, by O. A. Stevens (pp. 8–11); The Vitamin Content of Wheat Germ, by D. Knowles (pp. 11, 12); and Flax Cropping and the Seed Problem, by H. L. Bolley (pp. 12–15).

Report of the Puerto Rico Experiment Station, 1938, [A. Lee] (*Puerto Rico Sta. Rpt. 1938, pp. [2]+137, figs. 37*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Fifty-first Annual Report [of Texas Station], 1938, A. B. Conner et al. (*Texas Sta. Rpt. 1938, pp. 281*).—The experimental work not previously reported is for the most part noted elsewhere in this issue.

NOTES

Arkansas University and Station.—A new farm laborer's house has been built on the main station farm for $1,400 as a demonstration of the possibilities for adequate low-cost housing under average farm conditions. It is a four-room modern house, 32 by 24 ft., which includes a fire-safe chimney, a complete kitchen-cabinet construction, vertical pine boards for the inside wall finish, four storage closets, and the installation of electricity and plumbing. The house also has double floors and outside walls and high-quality paint finishes, and a screened work porch opens off the kitchen. To achieve the low cost, native rough-sawed lumber, creek gravel, and field stone replaced higher-priced commercial materials, and only one skilled man was used throughout the construction. Other savings included the making of screens and doors and the use of barn-door hardware. The house cost $1.80 per square foot of finished floor space and 13 ct. per cubic foot of volume. One-third of the cost was for labor and two-thirds for materials, of which approximately $250 was for plumbing and electricity. Of the 1,252 hr. of man labor, 565 were common labor, 427 skilled and supervisory carpenter work, and 260 other skilled labor. The house took 7 weeks to build.

With the possibility of a new cash crop for Arkansas in mind, breeding, psysiologic, and agronomic studies on flax are planned at the Cotton and Rice Substations. The best obtainable oil-producing varieties of flax will be introduced from flax-growing States and tested for adaptability to Arkansas conditions. Cultural methods and fertilizer requirements will be studied, and varieties and strains will be tested for percentage of oil in the seed and for quality and drying capacity of the oil.

A research project on underplanting hardwoods with shortleaf pine is being begun at the Livestock and Forestry Substation, near Batesville. The object is to help determine the feasibility of underplanting worn-out farm woodlands in northern Arkansas with this type of pine.

A survey of the incidence and kinds of internal parasitism of Arkansas cattle is projected. This will include a study of the type of soil, crop rotation, use of permanent pastures, problems of adequate water supply, and use of swampland, and will be used to formulate plans of parasite control in different sections of the State.

Dr. Violet M. Wilder has been appointed instructor in agricultural chemistry.

Connecticut State Station.—Dr. Stuart B. LeCompte, Jr., has been appointed assistant plant physiologist at the Tobacco Substation beginning March 1.

Delaware Station.—W. C. Skoglund has been appointed assistant research poultryman beginning February 1.

Georgia University.—Frank E. Mitchell, associated with the poultry department since his graduation from the university in 1924 and professor and head of the department since 1930, died January 10 at the age of 44 years.

Minnesota University and Station.—Under a State appropriation of $350,000 for construction of a plant industry building on the agricultural campus, the university has drawn preliminary plans calling for the erection of two equal sized units, each providing from 20,000 to 25,000 sq. ft. of floor space devoted mainly to offices and laboratories. One unit will be occupied by the division of

agronomy and plant genetics and the other by the division of plant pathology. Building operations are expected to start this spring. Later units are contemplated embodying an auditorium, lecture rooms, and two sets of greenhouses.

A new $25,000 administration building for the Northeast Substation at Duluth was occupied late in 1939. This completes the main group of buildings originally planned at this substation, which was established in 1913 to serve the red drift heavy soil portion of the timbered area of northeast Minnesota covering some 14 counties. The new building includes offices and laboratories, living quarters for special assistants, a vault, and an apple storage room.

The station has received from the Herman Frasch Foundation an award for the 5-year period beginning with January 1940 of $9,000 annually for research on a project entitled A Comprehensive Study of the Sulfur Metabolism in Plants, with the suggestion that in its application this project be made as general as possible to include consideration of sulfur deficiency of soils in all parts of the United States. The money will be used to continue and enlarge a project that has been carried on for several years at the station and on which several reports have been published. The problem will be divided into two parts. One, handled by the division of soils, will be a study of the sufficiency for maximum crop yields of the annual fall of sulfur in rain, snow, and dust, together with the sulfur dioxide absorbed by the soil directly from the atmosphere. The other, to be undertaken by the division of agricultural biochemistry, will be a study of how plants use sulfur and how animals react to feed that is lacking in this element. The study is tentatively planned to deal primarily with the metabolism of sulfur by the plant in the hopes of elucidating some of the mechanisms and intermediate products which may be involved in the transformation of soil sulfur into such organic compounds as glutathione, sulfur-containing amino acids, sulfur mustard oils, and thiamin (vitamin B_1).

Through cooperative arrangement with the U. S. D. A. Bureau of Plant Industry, an oil seed laboratory is being established in the division of biochemistry, primarily for investigations on flaxseed. Initial work undertaken will deal with biochemical phases, but the agreement provides for a wide range of work on flaxseed problems and possibly on other oil seeds. John A. Schricker has been detailed to conduct the work in cooperation with the section on cereal technology.

Dr. Royal N. Chapman, dean of the graduate school, died December 2, 1939, at the age of 50 years. Dr. Chapman was a native of Minnesota, graduating from the university in 1914 and receiving the Ph. D. degree from Cornell University in 1917. For the next 13 years he was associated with the biological work of the university and station, mainly in entomology. In 1930 he became director of the Pineapple Producers' Station of Hawaii and dean of the Graduate School of Tropical Agriculture of the Hawaii University, returning to Minnesota in July 1939.

Dr. Clifford P. Fitch, professor and chief of the division of animal pathology and bacteriology since 1917, died January 11. Born in Sauquoit, N. Y., on July 4, 1884, Dr. Fitch was graduated from Hamilton College in 1906, receiving the D. V. M. degree from Cornell University in 1911 and the D. Sc. degree from Iowa College in 1929. From 1909 to 1917 he was a member of the Cornell veterinary faculty. He was president of the American Veterinary Medical Association in 1933-34.

Dr. J. H. Neal, assistant professor of agricultural engineering and assistant agricultural engineer, has resigned to become head of the department of agricultural engineering at the Alabama Polytechnic Institute and has been succeeded by Philip W. Manson.

Dr. W. P. Ranney, assistant in farm management, has resigned to become associate professor of agricultural economics in the University of Tennessee, where he will teach farm accounting, farm management, and marketing and carry on research in farm management. Other resignations effective January 1 include Lyle A. Churchill, State county agent leader, to go into private business; Dr. J. C. Shaw, associate physiologist in the dairy division, to become assistant professor of dairy husbandry at the Connecticut University; and Dr. Iver J. Johnson, associate professor of agronomy and associate plant geneticist, to become professor of farm crops at the Iowa College.

Rutgers University and New Jersey Stations.—A. W. Blair, professor of agricultural chemistry and soil chemist, retired January 2 after 28 years' service and was succeeded by Dr. Firman E. Bear, science editor of *Country Home Magazine*.

New Mexico Station.—D. E. Wasson has been appointed assistant in agricultural economics, effective December 1, 1939.

Ohio State University and Station.—John W. Wuichet, animal husbandry specialist in the extension service of the university, died January 13, aged 53 years. He was a native of Ohio and a graduate of the university in 1908.

R. M. Salter, chief of the division of agronomy, has been appointed associate director of the station, effective April 1.

Oregon College and Station.—The new chemistry building was dedicated December 2, 1939. This building is a P. W. A. project costing $425,000 and will house the laboratories of chemistry and chemical engineering and the department of agricultural chemistry of the station.

Pennsylvania College and Station.—During the past year the college has acquired 500 additional acres of land for agricultural instruction and research, making a total of 3,000 acres in one tract. Most of the new area will be used for forestry and wildlife research. A farm of 125 acres near Montrose, in Susquehanna County, has been acquired on a 10-year lease and will be used for pasture research in cooperation with the U. S. Department of Agriculture.

The four new buildings of the School of Agriculture—agricultural science, forestry, agricultural engineering, and poultry research—have been completed, and it is expected that they will be in use before July 1. A new unit of the station range of greenhouses, 150 by 50 ft., has been erected, which will be used mainly for plant breeding.

Dr. S. W. Fletcher, vice dean and director of research, who has served as acting dean and director since January 1, 1939, has been appointed dean and director.

Tennessee University.—Dr. Harry M. Jennison, professor of botany since 1923, died January 5. Dr. Jennison was born in Worcester, Mass., on June 24, 1885, graduated from the Massachusetts College in 1908, and received the A. M. degree from Wabash College in 1911 and the Ph. D. degree from Washington University of St. Louis in 1912. His early service was as instructor in botany in the Massachusetts College, Wabash College, and the Montana College, followed by service in the last-named institution from 1913 to 1922 as assistant professor of botany and bacteriology and extension botanist, as well as with the U. S. D. A. Bureaus of Plant Industry and Entomology and the National Park Service.

Utah College and Station.—Dr. R. A. Rasmussen, instructor in agricultural chemistry in the Missouri University and station, has been appointed assistant professor of animal husbandry in charge of teaching and research in animal nutrition. Dr. Sadie O. Morris, assistant professor of foods, has been appointed head of the department of home economics at Eastern Illinois State Teachers College.

EXPERIMENT STATION RECORD

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THE EFFECTS OF THE PREVAILING WORLD CONDITIONS ON AGRICULTURAL RESEARCH PUBLICATIONS

Inevitably the disturbed condition of the world is having a severe reaction on agricultural research. In 1933 the Office of Experiment Stations compiled a list entitled Agricultural Research Institutions and Library Centers in Foreign Countries, and a year later reissued this list without discovering extensive changes. Today the list is in need of radical revision as to several countries, but the task is being deferred until there is a reasonable assurance that the product will not be out-of-date before it can be distributed.

To begin to realize how catastrophic have been the developments of the past few years it is only necessary to recall events in China, Czechoslovakia, and Poland. In China alone announcement was made early in 1939 that of the 114 Government-supported universities, 54 had been destroyed or closed, and of the 12 American-supported colleges only 2 were still conducting all of their work on their own campuses. Not all of these, of course, were concerned with agriculture, but of 15 agricultural research centers in China still believed to be functioning, only the Lingnan University of Canton is reported at its previous address. Four of the remainder—the Chinese National Department of Agriculture, the Agricultural Department of Fuh Tan University, the College of Agriculture of the National Central University, and the College of Agricultural Science of Shantung University—are said to be relocated in Chunking in the midwestern province of Szechwan, and the University of Nanking, the Rural Institute of Cheloo University, and the Provincial Agricultural Improvement Institute in the same province at Chengtu. The Institute of Agricultural Research of Tsing Hwa University, formerly of Peiping, is said to have been transferred to Kunming in Yunnan.

Under modern conditions the devastating effects of war are by no means confined to invaded nations or even to belligerents. The commencement of hostilities in Europe was soon followed by reports of changes in periodicals and other publications specializing in agricul-

tural research not only in the warring countries but in neutral realms as well. If the struggle continues it seems only too probable that the repercussions have only begun.

Among the first publications to which the war brought cessation of activities was *Science Progress*, now in its thirty-fourth volume, the newly established *Bulletin of Animal Behaviour*, the *International Cotton Bulletin*, and the *Empire Cotton Growing Review*. The British Imperial Economic Committee also gave notice of the suspension of nine publications dealing with the marketing of wool, tobacco, milk, fruits, and other commodities. From Germany came word of the discontinuance in the fall of 1939 of *Allgemeine Forst- und Jagd-Zeitung*, *Kleintier und Pelztier*, and *Baumwollbörse Wochenbericht*. In Italy the suspensions included *Statistica del Commercio Speciale di Importazione ed di Esportatione del Regno d'Italia* and *Gazzetta Officiale del Regno d'Italia—Bollettino Mensilo di Statistica Agraria e Forestate*. In France the director of *L'Agronomie Coloniale* announced the termination of this publication because of the mobilization of the majority of its collaborators, but stated that it was hoped to resume under a new name in the near future.

As an example of a change in both frequency of issue and scope of subject matter, the widely known *Journal of the Ministry of Agriculture* of Great Britain may be cited. Announcement was made in its issue for December 1939 that this publication, long a monthly, is to appear during the war at quarterly intervals. "This change", it is stated, "has been deemed advisable not only in the interest of economy of materials but because the problems of immediate urgency to farmers, such as inevitably arise in the course of an intensive food production campaign, can be dealt with more appropriately by means of broadcasting, or through the daily or weekly press, than through the medium of a monthly publication." The announcement points out, however, that there are still "many subjects of agricultural interest which can be studied in the more leisurely atmosphere of a quarterly journal, and the Minister trusts that his decision to continue the issue of the *Journal* on that basis will be welcomed by many who are concerned with practical or scientific agriculture."

On the other hand, recognition is not lacking of a realization that wartime agricultural research means primarily a redefinition of objectives and a redirection of effort. A recent address by Sir Jagdish Prasad, member of the Council for Education, Health, and Lands in India, points out that "it is a common fallacy to believe that in times of emergency research is the first thing to retrench, particularly research that, to employ a much misused word, does not have an immediately 'practical' aspect. . . . In agriculture, pure research has resulted in knowledge now daily applied in soil treatment, in manur-

ing, in dealing with fungus and insect diseases, and in breeding new varieties of plants. Well-planned long-term pure research should, therefore, not be considered a luxury marked for elimination the moment war breaks out." Where a choice must be made, he concludes, there must be a focusing on such problems as are obviously connected with wartime needs. Probably because of this special emphasis *Indian Farming*, a monthly, has been set up to replace the bimonthly *Agriculture and Livestock in India*, which had been published by the Imperial Council of Agricultural Research of India since 1931. The aim of the new magazine is to present scientific information in a popular, easily assimilable form, and the initial number states that "the time is not inopportune for such a popular publication. The stress and strain of war lends additional emphasis to the need for the development of India's agricultural resources, and in the task which lies before the country, namely, of increasing productivity and stopping waste, agricultural research is called upon to play a leading part. The need is all the greater for popular expositions of new and economical methods of production and management."

Nevertheless, the release of titanic destructive forces in the world must lead to the suspension and perhaps the abandonment of many worthy projects, and a shrinkage in the published output will almost certainly develop. The curtailment and depletion of original publications will doubtless be reflected in the output of abstract journals, but this stage is, of course, not reached immediately and variations may be expected between different journals as to its intensity. Such information as is available indicates that for *Chemical Abstracts* and *Biological Abstracts* there has been as yet less disturbance than had been feared, and that much of this results from the irregularity of receipt of certain journals from abroad rather than on outright permanent losses.

Because of the inadequacy of existing space provisions and a consequent specialization on publications of the experiment stations, the Department of Agriculture, and other research agencies of the Western Hemisphere, the effect on *Experiment Station Record* should be less noticeable than would be the case if a complete world review of literature were being attempted at this time. Nevertheless some differences, particularly in the case of British publications, may be observable and result in readjustments, particularly if hostilities are prolonged and the area of operations is extended.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Report of the Chief of the Bureau of Agricultural Chemistry and Engineering, 1939, H. G. KNIGHT (*U. S. Dept. Agr., Bur. Agr. Chem. and Engin. Rpt., 1939, pp. 98*). This first report of the newly constituted Bureau (E. S. R., 81, p. 754) includes food research on vegetables and vegetable processing, citrus, apple, and other fruit products, the baking and staling of bread, rancidity of vegetable oils, composition of wildrice, eggs and egg products, enzymes, composition and properties of naturally occurring fat acid glycerides, flavor of Montmorency cherry juice, physiological investigations of phenothiazine and other insecticides, chronic toxicity of cadmium, chemistry of tobacco mosaic virus, the preservation of biological specimens, and the removal of hulls from sticktight walnuts; carbohydrate research with sugarcane and cane sugar, beet sugar, farm-made sirups, honey, starch extraction from sweetpotatoes, and hemicelluloses; oil, fat, and wax investigations with stillingia oil, ben or moringa oil, and the deterioration of tung nuts in storage; protein research on the digestion of casein with trypsin and the consequent liberation of cystine, zein and other proteins in corn, effects of storage on proteins of grains and seeds, selenium in toxic plants, and effects of raw soybean meal on vitamin A; allergen investigations with cottonseed and cotton products; hides and skins, tanning materials, and leather; bagasse molding powders; lignin, hemicelluloses and lignocelluloses; fermentation investigations with *Rhizopus oryzae*, *Aspergillus niger*, and *Acetobacter*; chemical conversion of oils, fats, and waxes; preparation of plastics; utilization of soybeans and soybean products; production and use of sodium chlorate; naval-stores research; fertilizer research noted on page 596; and engineering research noted on page 686.

Carbohydrates of wheat leaves, G. KROTKOV (*Plant Physiol., 14 (1939), No. 3, pp. 559–565*).—Following alcoholic extraction of wheat leaves in the stage of early maturity the residue was found to liberate sugars after hydrolysis with disodium hydrogen phosphate, digestion with trypsin, and hydrolysis with 1 percent sulfuric acid. Alcohol-soluble sugars and those produced by mild hydrolysis with disodium hydrogen phosphate had an invert sugars: reducing sugars ratio above unity, but sugars liberated on tryptic digestion had a preponderance of reducing over invert sugars. The union between the component parts of the carbohydrate-protein complex was not broken down on digestion with 1 percent sulfuric acid, and sugars were liberated from such a complex only after tryptic digestion of its protein fraction.

Pectin content of plant materials, W. E. ELWELL and W. M. DEHN (*Plant Physiol., 14 (1939), No. 4, pp. 809–816*).—The authors obtained comparative data on the pectin content of a wide variety of plant materials and made some study of the enzyme processes involved in the break-down of pectin. They show that slower growing, woody plants contain but small quantities of pectin material, while the fast growing vegetables contain large quantities. They also found, however, that conditions of high pectin content and fast growth

do not favor the formation of the gelling type of pectin. Plants that possess pectin of high gelling power usually contain less than 10 percent of pectin on the dry basis, while those of low gelling power are of the vegetable type and contain more than 10 percent pectin. Stems and branches of plants may also yield pectin of the gelling type, as in the cases of Scotch broom, bracken fern, sowthistle, and St. Johnswort. Other sources of gelling pectin are mountain-ash, highbush cranberry, cranberry, snowberry, St. Johnswort buds, and pea hulls.

The natural process of pectin alteration in plants was found to follow the course of protopectin hydrolysis followed by hydrolysis of soluble pectic compounds and pectates. It is concluded that during ripening the type of pectin that is obtained by the third extraction undergoes the most rapid change of the three types of pectic compounds. There was an accompanying decrease in amount of the pectic material of the types derived by the first and second extraction processes. The rate of decrease in these types was less, indicating that the enzymatic processes involved in the degradation of the difficultly soluble type of pectic material proceed more rapidly than those that effect the soluble type.

List of publications on chemistry of wood and derived products, July 1939. (Coop. Univ. Wis.). (*U. S. Dept. Agr., Forest Serv., Forest Prod. Lab., 1939, pp. [1]+33*).—This bibliography contains instructions for obtaining publications, a general reference list, and classified references under the following captions: Chemical composition of wood, chemical and physical properties of wood, chemical industries using wood, chemistry of wood preservatives, and other publication lists issued by the Forest Products Laboratory, the first three classifications being further subdivided into several more specific topics.

Some effects of metal salts on yeast dehydrogenase, C. W. Hock (*Plant Physiol., 14 (1939), No. 4, pp. 797–807, fig. 1*).—The cations studied showed an inhibitory effect upon the dehydrogenase activity of yeast cells as follows: Hg>Cu>Au>Th>La>Ba>Mn>K. The cations were inhibitive to the dehydrogenase system of yeast extract in the following order: Hg>Cu>Au>Th>La>Ba; Mn and K showing no inhibition.

At low concentrations four of the cations accelerate slightly when yeast cells are used: Mn>Cu>Th>Au. It was further shown that in yeast extract Mn, Ba, and K accelerate dehydrogenase action markedly, especially at high concentrations. Th, Hg, Cu, and Au cause a slight acceleration in low concentrations, but inhibit strongly in high concentrations. Both high and low concentrations of Mn promote the catalytic activity of the extract. La in low concentrations has no effect, but inhibits in high concentrations.

Characteristics of the tyrosinase system in potatoes which blacken after boiling, A. F. Ross, W. E. Tottingham, and R. Nagy. (Wis. Expt. Sta. and Univ.). (*Plant Physiol., 14 (1939), No. 3, pp. 549–557, figs. 3*).—Phosphate buffer solutions accelerated the oxidation of tyrosine, while borates and phthalates inhibited the reaction in proportion to the concentration of the buffer. The tyrosinase activity of tubers which discolor was higher than that of normal tubers. The difference in activity was apparent in several different buffers, in unbuffered solutions, and at different pH values. Greater differentiation was apparent in either borate or unbuffered solutions than in phosphate buffers. An activator of tyrosinase was found in the boiled sap of abnormal potatoes. It was not found in the ash and was lost in prolonged boiling or upon standing, and in dialysis. The activating effect was apparent in unbuffered solutions and in those buffered with borate but not in phosphate buffers.

A study of the reactions of silk fibroin with acid and basic dyes, E. C. Hoffman and P. B. Mack. (Pa. State Col.). (*Jour. Phys. Chem., 43 (1939),*

No. 5, pp. 647–662, figs. 11).—The dyeing reaction with each of the seven dyes studied was found to conform to the Freundlich adsorption isotherm under the conditions employed, insofar as the amount of dye taken out of baths of different initial concentration per unit weight of silk fibroin was concerned. Changes in pH value resulting from variation in the concentration of the dye or occurring during the dyeing process are discussed.

Experimental durum milling, M. C. MARKLEY. (Minn. Expt. Sta.). (*Northwest. Miller, 190 (1937), No. 5, p. 52, fig. 1*).—A set-up and method used for milling semolina from small samples of durum wheat is briefly described and is illustrated by a diagram showing a very simple flow without provision for the production of commercial byproduct flours.

[A. O. A. C. reports presented at the 1938 meeting] (*Jour. Assoc. Off. Agr. Chem., 22 (1939), No. 3, pp. 471–476, 480, 481, 486, 489–495, 507–513, 515–517, 519–523, 526–542, 544–550, 561–587, 588, 593–598, 599–624, 628–650, 662–677, figs. 6*).—The following reports are contributed from land-grant institutions, the U. S. Department of Agriculture, or the National Bureau of Standards, as respectively indicated: Plants, by E. J. Miller (Mich.); the less common elements—modification of the tentative method for determination of iodine in plant material, by J. S. McHargue and E. B. Offutt (Ky.); carbohydrates in plants, by J. T. Sullivan (U. S. D. A. and Pa.); cheese, by I. D. Garard (N. J.); lactose in milk—effect of volume of precipitate on accuracy of polarimetric determination, by E. R. Garrison (Mo.); difference between dairy products made from cow's milk and those made from the milk of other animals, by I. D. Garard (N. J.); turpentine, by V. E. Grotlisch (U. S. D. A.); radioactivity—simple and inexpensive charger for electroscopes and report on quantum counter, both by A. E. Mix (U. S. D. A.); cereals, by V. E. Munsey (U. S. D. A.); ash in flour, macaroni products, and baked products, by L. H. Bailey (U. S. D. A.); acidity in flour, by L. Zeleny (U. S. D. A.); sugar in flour, by R. M. Sandstedt (Nebr.); flour-bleaching chemicals, by D. B. Scott (U. S. D. A.); milk solids in bread, by V. E. Munsey (U. S. D. A.); cold water extract in flour, by H. C. Fellows (U. S. D. A.); standard solutions and standardization of acidimetric solutions, both by R. L. Vandaveer (U. S. D. A.); iodine and thiosulfate solutions, by K. L. Milstead (U. S. D. A.); pyrethrum products, derris, and cube, by J. J. T. Graham (U. S. D. A.); sugars and sugar products, by R. F. Jackson (Natl. Bur. Standards); the basic values of the Clerget divisor and the correction coefficients, by R. F. Jackson and E. J. McDonald (Natl. Bur. Standards); drying, densimetric, and refractometric methods, by C. F. Snyder (Natl. Bur. Standards); vinegars, by A. M. Henry (U. S. D. A.); flavors and nonalcoholic beverages, by J. B. Wilson (U. S. D. A.); organic solvents in flavors, by R. D. Stanley (U. S. D. A.); meat and meat products, by R. H. Kerr (U. S. D. A.); baking powders—cream of tartar and tartaric acid in tartrate baking powders, by B. G. Hartmann (U. S. D. A.) cacao products, by W. O. Winkler (U. S. D. A.); gums in food products—mayonnaise and French dressing, by F. L. Hart (U. S. D. A.); oils, fats, and waxes, by G. S. Jamieson (U. S. D. A.); refractometric determination of oil in seeds (soybeans), by L. Zeleny and M. H. Neustadt (U. S. D. A.); the Polenske value of fats and oils, by R. S. McKinney (U. S. D. A.); microchemical methods—alkoxyl determination, by E. P. Clark (U. S. D. A.); microbiological methods, by A. C. Hunter (U. S. D. A.); ash in feeding stuffs, by J. L. St. John (Wash.); mineral mixed feeds, by A. T. Perkins and B. W. Beadle (Kans.); biological methods for components of the vitamin B complex, by O. L. Kline (U. S. D. A.); carotene, by V. E. Munsey (U. S. D. A.); manganese in stock feeds, by J. B. Smith and E. J. Deszyck (R. I.); and adulteration of condensed milk products and cod-liver oil, by P. B. Curtis (Ind.).

Sintered Pyrex glass aerators, G. H. CARROLL (*Plant Physiol.*, *14* (*1939*), *No.* *3*, *pp.* *603–605*, *fig.* *1*).—Glass scraps powdered in a ball mill and sifted on bolting cloth to exclude particles smaller than 173 mesh or larger than 125 mesh provided suitable material. The sintering was done in a muffle furnace in solid nickel rings at 780° C., this temperature being maintained for 20 min. The disks could be sealed to tubes by either of two methods, the second of which requires little or no previous glass-blowing experience.

The calibration of a constant recording illuminometer when the sensitive sampling surface is horizontal, D. R. WILLARD and J. B. SMITH. (R. I. Expt. Sta.). (*Plant Physiol.*, *14* (*1939*), *No.* *3*, *pp.* *595–598*, *figs.* *2*).—With a suitable cell mounted horizontally and covered with a flat, white glass surface capable of removing 75 percent of the total light, the recording illuminometer may be calibrated for light falling on a horizontal surface, using either a Weston or a Macbeth illuminometer as a standard. The maximum error should not be greatly in excess of 7 percent, arises from variation of observations from the desired straight line relationship for any cause whatever, and does not include errors in the instruments. The calibration is not permanent and must be repeated at intervals.

Determination of arsenic in soil treated with acid lead arsenate, L. KOBLITSKY. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem.*, *22* (*1939*), *No.* *3*, *pp.* *680–683*).—The author finds that the distillation procedure specifying hydrazine sulfate-sodium bromide solution as the reducing agent, followed by an iodine titration, is a satisfactory method for determining arsenic in soils treated with acid lead arsenate. The distillation is conducted so that approximately 150 cc. is distilled in 2 hr., and additions of hydrochloric acid are made before the volume is reduced to 75 cc. This reduces the color of the distillate so that the end point is not obscured. The appearance of color can be prevented entirely by oxidizing the organic matter in the distillation flask with 30 percent hydrogen peroxide prior to distillation.

A rapid method for chlorides in tomato products, L. M. BEACHAM. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem.*, *22* (*1939*), *No.* *4*, *pp.* *765*, *766*).—A rapid method for determining the chlorides present in tomato products by means of alcoholic extraction and precipitation with silver nitrate is described. This, when compared with the present Official method, gave equally accurate results, as it did when used on authentic samples having a known amount of chlorides added.

An objective method for measuring grittiness in canned pears, L. M. BEACHAM. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem.*, *22* (*1939*), *No.* *4*, *pp.* *766–768*).—Following grinding, boiling with a dilute sodium hydroxide solution, and mechanical stirring, the diluted pulp was filtered out through a 30-mesh Monel metal sieve, grit cells 0.02 in. or more in diameter having been found responsible for the gritty feeling in eating the pears.

Determination of hydrocyanic acid by the picric acid method and the KWSZ photometer, J. T. SULLIVAN. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem.*, *22* (*1939*), *No.* *4*, *pp.* *781–784*, *fig.* *1*).—A procedure for the determination of small quantities of hydrocyanic acid in individual white clover plants utilizes a photometer for the measurement of the color change in the alkaline picrate—hydrocyanic acid reaction. Hydrocyanic acid may be measured in amounts of 0.01–0.2 mg. The slightly acidified 10 percent aqueous solution of copper sulfate proved a better filter for determining the photometric transmission curves than glass filters having their transmission maxima either at 450 or 650 mμ.

It is pointed out that various steps of the procedure, especially the conditions of autolysis and distillation, need further study, particularly if the method is to be applied to plants other than white clover.

Copper determination in the blood serum [trans. title], H. G. SCHMIDT (*Biochem. Ztschr., 302 (1939), No. 3-4, pp. 256-261, figs. 2*).—The method of Heilmeyer and Stüwe for the determination of copper is adapted for use in serum analysis. Four cc. of serum are deproteinated with 2 cc. of 6 N HCl, followed by 2 cc. of 20-percent trichloroacetic acid. The filtrate obtained is treated with ethyl alcohol (1.3 cc. per cubic centimeter of filtrate) and made ammoniacal by the addition of 20-percent ammonium hydroxide (0.2 cc. per cubic centimeter of filtrate). After cooling under the tap, a few drops of the reagent (a 2 percent alcoholic solution of diethyldithiocarbamate) are added. The color develops in a few minutes, and the mixture is transferred to the cell (50 mm. length) of the step photometer from which the extinction coefficient is read, using the S 43 filter (against alcohol). A blank determination is run simultaneously, using 4 cc. of water in place of the serum, and the reading obtained is subtracted from the test reading. This corrected value is divided by 5 and multiplied by 920 (a constant representing dilution of serum, 0.50, times 4.6×20^{5}, the absorption constant of the copper diethyldithiocarbamate per 100 cc. of serum) to obtain the copper content of the serum expressed directly as γ percent. The method permits exact estimation of as little as 1γ of copper, zinc and cadmium do not interfere, and iron in the amounts in which it is present in serum is likewise not an interfering element. Values from 80γ to 140γ percent were found for copper in normal bloods.

A new apparatus for photoelectric recording of the coagulability of blood and other progressing processes, K. K. NYGAARD (*Jour. Lab. and Clin. Med., 24 (1939), No. 5, pp. 517-522, figs. 3*).—The apparatus, described in detail and illustrated by photograph and by diagram, is termed the "photelgraph." Although discussed with particular reference to its use in determining blood coagulability, it is considered applicable to other progressing processes, which, during their progression, affect a variation of light transmitted through the specimen under observation. The apparatus may be considered as made up of two main parts, the registering and the recording system. The former registers, by means of a photoelectric cell, the variations of light occurring during the progressive process, while the latter automatically records these variations.

The photoelectric determination (photelgraph) of ascorbic acid, T. GUTHE and K. K. NYGAARD (*Soc. Chem. Indus. [London], Chem. and Indus., 57 (1938), No. 52, pp. 1195-1199, figs. 6*).—The photelgraph (see above abstract), applied here in the quantitative determination of ascorbic acid by the methylene blue reduction method, is modified slightly by introducing monochromatic homogeneous illumination of the reaction vessel and special heat-absorbing filters for maintaining a low constant temperature of the water bath. The main features of the apparatus are illustrated by a diagrammatic cross section of the registering and recording units.

The determination is carried out by placing 0.5 cc. of the specimen to be tested and 0.1 cc. of the indicator solution in a specially designed reaction cell, which is inserted in the water bath. Upon exposure to light the ascorbic acid is activated, as indicated by reduction of the dye. The progressive bleaching of the dye results in increasing values of transmitted light, these values being recorded on a rotating film. The actual tracing of the reduction, referred to as a "scorbelgram," is seen between two other recorded values, the one, a base line, representing the photoelectric value of a nonreduced specimen and the other, the top line, indicating the value of a completely reduced specimen. The linear

distance between the top line and an identical point (as to time) on the reduction curve gives an expression of the degree of reduction. This linear distance is designated as the "deviation value," and its significance is illustrated by a series of scorbelgrams. A correlation curve, in which the deviation values obtained (under standard conditions as to quantity and quality of radiant energy, temperature, and concentration of the dye solution) with varying concentrations of ascorbic acid are plotted against the micrograms of ascorbic acid per cubic centimeter, may be used as a standard of reference in estimating the micrograms of ascorbic acid in unknown specimens. "By calibration of the photelgraph for application to the analysis of ascorbic acid, it was found that amounts less than 0.05 μg. per cubic centimeter could be recorded on the film. Based on several hundred observations, the error of determination is about 1 percent."

Studies in the stability of vitamins A and D.—II, Action of fatty peroxides on vitamin A, E. L. SMITH (*Biochem. Jour., 33 (1939), No. 2, pp. 201–206, fig. 1*).—Various vitamin A concentrates dissolved in arachis oil at a uniform strength of 12,000 International Units per gram and stored at room temperature for many months showed destruction of the vitamin A, the rate of destruction varying but in general being greatest in solutions that developed high peroxide values. To test more rigorously the theory that fatty peroxides slowly oxidize vitamin A, a series of liver oils and concentrates were dissolved in rancid olive oil of peroxide value 260 and heated to 100° [C.] in nitrogen-filled sealed tubes. At intervals the tubes were removed from the water bath and the amount of vitamin A present determined by measuring the absorption at 328 mμ. The absorption steadily diminished with time of heating, the destruction being more rapid with the concentrates (of fish and mammalian origin) in which the vitamin existed in the form of an alcohol than with the fish-liver oils in which the vitamin occurred as an ester. That the greater stability in the fish-liver oils was due to the existence of the vitamin in the form of an ester was demonstrated by subjecting a reesterified fish-liver oil concentrate to the same treatment. In the esterified form the rate of destruction of the vitamin was similar to that in the fish-liver oils.

In further experiments two concentrates were dissolved in samples of olive oil and coconut olein showing peroxidase values varying from 0.5 to 125. The solutions were sealed into tubes (under nitrogen) and heated under identical conditions. Again, the amount of destruction of the vitamin was found approximately proportional to the peroxide value and independent of the nature of the oil. At the higher temperature (2 and 4½ hr. at 100°), the destruction was somewhat greater than at the lower temperature (45 hr. at 50°), indicating that heat itself exerted some destructive action on the vitamin. Similar experiments conducted with an esterified fish-liver oil concentrate showed the ester to be more stable, since no destruction occurred except with oils having a peroxide value of 36 or higher. Beyond this point, however, decreasing vitamin A value went parallel with increasing peroxide value.

Studies in the stability of vitamins A and D.—III, The effect of light on vitamin A, E. L. SMITH, F. A. ROBINSON, B. E. STERN, and F. E. YOUNG (*Biochem. Jour., 33 (1939), No. 2, pp. 207–212, figs. 6*).—Vitamin-containing oils and concentrates were exposed for varying periods of time to ultraviolet radiations of wavelengths exceeding approximately 300 mμ. Irradiation was effected by light from a mercury vapor lamp at various distances, by the spark from the tungsten steel electrode of the photometer, or by diffused daylight. Curves showing changes in the extinction coefficient under irradiation and during recovery periods showed a progressive decrease in the value of $E^{1\,\mathrm{percent}}_{1\,\mathrm{cm.}}$ 328 mμ, the decrease being the more rapid the more intense the irradiation. Even

diffused daylight had some effect. When the irradiated solutions were allowed to stand in the dark or in light of lower intensity, the value of $E_{1\,cm.}^{1\,percent}$ 328 mμ increased toward the original value. The further the value of $E_{1\,cm.}^{1\,percent}$ had been reduced by irradiation the less complete was the recovery in the dark. It is suggested that these results may possibly be explained by the hypothesis that vitamin A in an oil or concentrate likely exists as a mixture of geometrical isomerides, but that on irradiation energy is absorbed, causing a change in the proportion of isomerides. On removal from the radiation slow reversion to the equilibrium mixture occurs. Since reversion is not complete, however, it seems evident that there is a simultaneous irreversible photochemical change of the vitamin A into some other substance, possibly bicyclic with little absorption at 328 mμ.

The isolation of factor one in crystalline form, S. LEPKOVSKY. (Univ. Calif.). (*Jour. Biol. Chem., 124 (1938), No. 1, pp. 125-128, figs. 2*).—Starting with a fuller's earth adsorbate from rice bran, a method for isolating factor 1 in crystalline form is described. The ability to resist precipitation with lead or mercury salts and the characteristic ready precipitation with phosphotungstic acid are properties utilized in the isolation of the factor. Biological tests indicated that the crystals readily relieved the acrodynia-like dermatitis of rats, with simultaneous resumption of growth. This effect corresponded with previously described properties of the factor (E. S. R., 80, p. 239). A photomicrograph of the crystals is presented.

The determination of carotene, G. KERNOHAN (*Science, 90 (1939), No. 2348, p. 623*).—The method described is essentially the Tswett process of passing a solution of the plant pigments through an adsorbing column, the principal modification being the use of soda ash in place of MgO or $CaCO_3$ as the adsorbent. The filtering column is made of a filter tube with a small plug of cotton in the bottom in which the soda ash is packed. As used in determining carotene in alfalfa, a 1-gm. sample is placed in a flask with 100 cc. of petroleum ether and the stoppered flask set aside overnight, after which the solution is poured on the column and drawn through by suction. Fresh petroleum ether is added until it comes through clear in order to remove all of the carotene.

A colorimetric reaction for the quantitative estimation of nicotinic acid, E. BANDIER and J. HALD (*Biochem. Jour., 33 (1939), No. 2, pp. 264-271, figs. 2*).—For determination of nicotinic acid in colorless aqueous solution, a measured amount (up to 9 cc. and containing 0.005-0.25 mg. of nicotinic acid) is run into a 20-cc. graduated flask, and after 5 minutes' heating on a water bath at 75°-80° [C.], 1 cc. of 4 percent aqueous cyanogen bromide is added. The mixture is held on the water bath for another 5 min., cooled under the tap to room temperature, and treated with 10 cc. of a saturated aqueous solution of metol (*p*-methylaminophenol sulfate), enough water being added to bring the volume to 20 cc. After standing 1 hr. at room temperature excluded from light, the strength of the color developed is read off with a Pulfrich photometer (filter S 43), with a blank solution containing the same amounts of cyanogen bromide and metol plus distilled water to make the volume 20 cc. in the other cell. Detailed notes are given concerning the reagents, the steps involved in the analysis, the photometric determination, and the determination of the extinction curve. With pure aqueous solutions of nicotinic acid, it is believed that any error of the method is derived chiefly from the error in photometric readings.

For application to biological materials, these are first heated for ½ hr. on the water bath with 2 N NaOH to liberate the nicotinic acid from the nicotinamide. After neutralization and slight acidification with HCl, the brown-colored sub-

stances formed are precipitated from an aqueous phase by a large excess of acetone in which the nicotinic acid is soluble. The acetone extract is diluted with water, the acetone distilled off in vacuum, and the color reaction then carried out on the practically clear aqueous solution thus obtained. Details of this modification are discussed. Samples of yeast analyzed by the method yielded on the dry-weight basis from 16 to 61 mg. percent of nicotinic acid.

Nicotinic acid requirements of insects: A biological test for nicotinic acid, D. RUBINSTEIN and L. SHEKUN (*Nature* [*London*], *143* (*1939*), *No. 3634, pp. 1064, 1065*).—The authors report success in cultivating the wax moth (*Galleria melonella*) on a medium containing 1 part of yeast and 2 parts of wax. Autoclaving the yeast in an alkaline solution at 130° [C.] does not impair its efficacy, although thorough washing with water and alcohol does. The aqueous or alcoholic extract is capable of supporting the development of the moth. Nicotinic acid in amounts as small as 5γ–10γ per 100 gm. of the medium exerts the same favorable effect as the yeast extract in producing well-developed larvae. Doses of 1γ are insufficient, giving inconsistent results. If nicotinic acid is completely lacking, all larvae die in from 8 to 10 days. It is suggested that the development of the newly hatched *Galleria* larvae can serve as a sensitive biological test for detecting minute quantities of nicotinic acid.

Studies on the metabolism of pyruvic acid in normal and vitamin B_1-deficient states.—I, A rapid, specific, and sensitive method for the estimation of blood pyruvate, G. D. LU (*Biochem. Jour.*, *33* (*1939*), *No. 2, pp. 249–254, fig. 1*).—The method, described in detail as to reagents, technic, and precautions, involves the conversion of the pyruvic acid into its 2,4-dinitrophenylhydrazone. This is extracted with ethyl acetate from the aqueous solution and then separated from the excess hydrazine and the other hydrazones of aldehyde and ketone derivatives by extraction with sodium carbonate. Traces of the hydrazine or of the foreign hydrazones carried over by the ethyl acetate dissolved in the sodium carbonate are removed with a fresh lot of ethyl acetate. The stable red color developed by adding sodium hydroxide to the sodium carbonate extract is determined colorimetrically, using a photoelectric colorimeter with a Wrattan No. 62 light filter to eliminate interference of the yellow color. The exact amount of pyruvic acid present in the sample is read off from the standard curve established by determining the photoelectric cell readings obtained with a series of standards prepared from carefully purified pyruvic acid. The method, requiring only 2–3 drops of freshly shed blood, is rapid, specific, and sensitive, estimating 2 μg. in 10 cc., a dilution of 1:5,000,000, with an error of ±1.5 percent.

A microbiological assay for riboflavin, E. E. SNELL and F. M. STRONG. (Wis. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, *11* (*1939*), *No. 6, pp. 346–350, fig. 1*).—The method, which is based on the essential nature of riboflavin for the growth of *Lactobacillus casei*, is described in detail as to the carrying of the stock culture, the preparation of the inoculum, the riboflavin-free basal medium, and the standard riboflavin solutions, and as to the procedure, the establishment of a standard curve, and the determination of bacterial response. The reliability of the method and the sources of error are also discussed. In any assay the bacterial development, using a standard inoculum, is determined by photoelectric measurement of the turbidity developed or by titration of the lactic acid formed. These results are read against the respective curves established with riboflavin solutions of known concentration. Under the conditions prescribed no difficulty is experienced in determining to ±5 percent even a few hundredths of a microgram of riboflavin per cubic centimeter when pure solutions are analyzed. The reliability of the method is supported by agreement

of the assay results at different levels, recovery of added riboflavin, successful determination in the presence of photolyzed extracts, and specificity of structure required for activity.

For application to natural products, an extract must be prepared either by autoclaving the finely divided material with a large volume of water or by extraction with boiling 0.1 N HCl and subsequent neutralization. Results are presented for riboflavin assays of milk and liver and of various natural products and biological materials. The results compare well with other bio-assays for riboflavin on the same products.

The determination of free and phosphorylated thiamin by a modified thiochrome assay, D. J. HENNESSY and L. R. CERECEDO (*Jour. Amer. Chem. Soc., 61 (1939), No. 1, pp. 179–183*).—Three alternate procedures for performing the thiochrome assay are given in detail, the considerations determining the choice of method being indicated. These procedures represent a direct method, a technic involving elimination of interfering materials by the use of a base-exchange zeolite, and a method involving enzymic hydrolysis of the pyrophosphoric ester of thiamin by an enzyme obtained as a stable powder from kidney. Results by the three methods compared with those obtained by bio-assay for a variety of materials indicate good agreement between the chemical and the biological tests. According to the findings, 1 International Unit is equivalent to 2.9 μg. of thiamin chloride and 4.0 μg. of cocarboxylase.

AGRICULTURAL METEOROLOGY

The drama of weather, N. SHAW (*Cambridge, Eng.: Univ. Press, 1939, 2. ed., pp. XIV+307, pl. 1, figs. 109*).—This edition of the book previously noted (E. S. R., 70, p. 743) includes some alterations and additions to the text and illustrations. It was found desirable to deal rather differently with the representation of the data of weather in a form suitable for application to its effects on crop growth, and a separate chapter is therefore devoted to that aspect.

Weather research and weather conditions (*U. S. Dept. Agr., Sec. Agr. Rpt., 1939, pp. 159–162*).—This report briefly discusses the national meteorological services, weather maps, charts of atmospheric circulation, and research in weather forecasting, summarizes the weather of the United States for 1939, and describes the drought of the past season in the Northeastern States.

Solar variation and the weather, C. G. ABBOT (*Nature [London], 143 (1939), No. 3626, pp. 705–709, fig. 1*).—A review of the results of the long campaign of the Smithsonian Institution on the variation of the sun, thus far including 40,000 measurements of the solar constant of radiation involving observations filling about 10,000 days, besides numerous interesting side researches.

[Papers at the twentieth annual meeting of the American Geophysical Union] (*Amer. Geophys. Union Trans., 20 (1939), pt. 3, pp. 341–356, figs. 18*).—The following papers are of interest to agricultural meteorology: Two Important Factors Controlling Winter-Time Precipitation in the Southeastern United States, by J. Namias (pp. 341–348); Some Upper-Air Observations Made in the Pacific, by W. M. Lockhart (pp. 348–352); Relationship of Low Temperatures Aloft to Precipitation, by A. K. Showalter (pp. 352, 353); and Evidence of a Sidereal Barometric-Pressure Wave, by H. B. Maris (pp. 353–356).

Reports and papers, regional meetings (*Amer. Geophys. Union Trans., 20 (1939), pt. 1, pp. 6–50, 53–79, 94, 99–124, 125–136, figs. 46*).—The following papers of meteorological interest are included:

(A) *South Pacific area.*—The History of Floods in Southern California, by H. B. Lynch; Rainfall on and Runoff From San Gabriel Mountains During Flood of March 1938, by M. E. Burke; The Functions of Debris-Dams and the

Loss of Reservoir-Capacity Through Silting, by E. C. Kenyon, Jr.; Hydraulic Design of Flood-Control Basins and Channels, by J. G. Jobes; Silt Problems of the West, by J. C. Stevens; Ground-Water Problems in the Southern High Plains, by W. N. White; Flood-Control Duties of the Corps of Engineers, United States Army, by T. Wyman, Jr.; The National Flood-Control Program in the United States Department of Agriculture, by H. E. Reddick (U. S. D. A.); Flood-Control in California, by E. Hyatt; Status of Proposed Bulletin on Principles and Practice of Snow-Surveying, by J. C. Marr; California Cooperative Snow-Surveys—Directions, Suggestions, and Hints for Snow-Surveyors, by F. H. Paget; Improvements in the Methods of Forecasting Stream-Flow, by C. Elges (Nev. Expt. Sta.); The Use of Precipitation-Gage Measurements in Forecasting the Inflow to Lake Mead, by O. C. Reedy; Need of Higher-Level Snow-Survey Courses in the Colorado River Drainage-Area of Western Colorado, by F. C. Merriell and M. C. Hinderlider; Anodyzing or Hardening the Surface of Snow-Samplers, by J. C. Marr (U. S. D. A.); Improvement in Mount Rose Spring Balance—"Tickling" Corky Snow, by F. H. Paget; Method of Applying Bakelite to Snow-Sampler, by W. Poulsen (Univ. Nev.); Paraffin Versus Enamel, Optimum Number of Sampling Points, Improvement of Tubular Balance, by F. H. Paget; Applying the Chatillon Iso-Elastic Springs to the Mount Rose Spring Balance, by C. Elges (Nev. Sta.); Shielded Storage Precipitation-Gages, by A. R. Codd (U. S. D. A.); and Progress-Report of Western Interstate Snow-Survey Conference, by H. P. Boardman (Univ. Nev.).

(B) *North Continental Divide area.*—Symposium on the Limit of Practicable Usefulness of Snow-Surveys Made in the Headwater-Regions When Used for Predicting Run-Off at Localities Quite Removed From the Courses—Fort Peck Reservoir, by D. B. Freeman, Northern Rocky Mountains, by H. T. Gisborne, and Smaller Watersheds, by J. P. Bonner (both U. S. D. A.), and Correlation of Headwater-Streams of North Continental Divide, by O. W. Monson (Mont. Sta.); Symposium on Effect of Soil-Priming by Fall Precipitation on Spring Runoff—Upper Snake Basin, by J. C. Marr (U. S. D. A.), Analysis of Snow-Cover and Runoff in Upper Snake, Upper Yellowstone, and Swift Current Watersheds, by O. W. Monson (Mont. Sta.), Relation of Fall Stream-Flow to Spring Runoff, by H. C. Eagle, and The Influence of Autumn Rainfall on the Runoff From Melting Snow, by R. C. Farrow; Outline of Snow-Surveyor's Manual, by J. C. Marr, Construction of Snow-Survey Shelter-Cabins, by R. A. Work and R. L. Parshall, and Shielded Storage Precipitation-Gages, by A. R. Codd (all U. S. D. A.); and Accuracy of Mount Rose Spring Balance.

Summer weather data, with design data, statistics, charts, maps, and technical analysis, compiled and edited by J. C. ALBRIGHT (*Kansas City, Kans.: The Marley Co., 1939, pp. XV+165, figs. [53]*).—The author has endeavored to supply a compilation of summer weather data for the United States in compact form. Material on the atmosphere and climate, the U. S. Weather Bureau, factors influencing summer weather, an analysis of summer weather data, dry bulb, wet bulb, and dew point temperatures, and wind and sunshine data are included, as well as applications of the weather data to air conditioning.

Analysis of fifty years' record of meteorological data, M. PARSHALL (*Colo. Sta. Bul. 456 (1939), pp. 16, figs. 2*).—The data collected by the station twice daily (7 a. m. and 7 p. m.) "consist of maximum and minimum temperatures, terrestrial radiation temperature, soil temperatures, relative humidity, dew point, barometric pressure, wind direction and total wind movement, precipitation, character of the day, and unusual phenomena. The evaporation loss from a free water surface is measured from about April 1 through October, or until such time as freezing prevents further observations. Graphic records

are also made of temperature, barometric pressure, hours of sunshine, wind direction, and wind movement." Fifty years of weather records, based on observations taken by the several meteorologists of the station, are available with few exceptions. This material is here briefly analyzed and discussed.

Meteorological observations, [1939], C. I. GUNNESS ET AL. (*Massachusetts Sta. Met. Ser. Buls. 601–612 (1939), pp. 4 each*).—These are the usual summaries of observations for each month at Amherst, Mass., with brief notes on the more significant features.

The December number contains an annual summary for 1939, which shows that the mean pressure for the year was 30 in.; the mean temperature 48° F., as compared with the normal of 47.4°, highest 93° July 7 and 8, lowest −4° January 27: total precipitation 38.82 in., as compared with the normal of 43.7 in.; snowfall 37.5 in., as compared with the normal of 47.78 in.; mean cloudiness 54 percent, bright sunshine 56.4 percent; last frost in spring May 16, first in fall October 15; last snow April 9, first November 9.

Symposium on floods, section of hydrology (*Amer. Geophys. Union Trans., 20 (1939), pt. 2, pp. 141–244, figs. 31*).—An introduction by M. Bernard (U. S. D. A.) and the following papers are included: Trends in a National Policy of Stream-Management, by T. Saville (pp. 143–154); Flood-Data in the United States, by G. H. Matthes (pp. 155–157); Great Floods in the United States, by C. S. Jarvis (U. S. D. A.) (pp. 157–166); Some General Observations of Physiographic and Climatic Influences on Floods, by W. G. Hoyt and W. B. Langbein (pp. 166–174); Recent Advances in Applied Hydrology With Reference to Flood-Forecasting, by L. K. Sherman (pp. 174–176); The Measurement and Computation of Flood-Discharge, by C. G. Paulsen (pp. 177–187); Recent Developments in Flood-Forecasting, by M. Bernard (U. S. D. A.) (pp. 187–193); Stream-Flow Forecasting by Snow-Surveying, by G. D. Clyde (Utah State Col.) (pp. 194, 195); Estimating Maximum Flood-Flow as a Basis for the Design of Protective Works, by G. A. Hathaway (pp. 195–203); Relation of Headwaters-Control to the National Program of Flood-Protection, by A. C. Ringland (U. S. D. A.) (pp. 203, 204); The Meteorological Phase of Flood-Forecasting, by H. R. Byers (U. S. D. A.) (pp. 205–207); The Mathematical Synthesis of the Flood-Hydrograph, by R. T. Zoch (U. S. D. A.) (pp. 207–218); and Economic Aspects of Flood-Forecasting, by G. F. White (pp. 218–233).

The permeability of a snow cover and its influence on the overwintering of plants [trans. title], O. GABRAN (*Met. Ztschr. [Braunschweig], 56 (1939), No. 9, pp. 354–356, fig. 1*).—The author presents an experimental study of the permeability of a snow cover under different conditions, and shows that with snow lacking a sawdust cover exhibits similar permeability relations. The results of the action of an interrupted ventilation and of deficient air diffusion on the overwintering of plants are also described.

Salt water injury of woody plants resulting from the hurricane of September 21, 1938, D. WYMAN (*Arnold Arboretum Bul. Pop. Inform., 4. ser., 7 (1939), No. 10, pp. 45–52, figs. 3*).

SOILS—FERTILIZERS

[Soil investigations of the Illinois Station] (*Illinois Sta. Rpt. 1937, pp. 20–47, figs. 16*).—Progress is briefly summarized under the following captions: Rate of run-off varies widely on different soil types, by Smith and R. S. Stauffer; alfalfa excels other crops as water and soil conserver, by E. E. DeTurk; more acres needed where soil fertility is declining and manure

improves even the most fertile Illinois soils, both by F. C. Bauer, A. L. Lang, C. J. Badger, L. B. Miller, C. H. Farnham, P. E. Johnson, and L. F. Marriott; old plats show the need of sound land-use practices, by Bauer, Lang, and Farnham; soybean management affects balance of nutrients in soil, by Bauer, Lang, H. J. Snider, Badger, Miller, Farnham, Johnson, and Marriott; some corn hybrids are more effective users of plant food, by Lang and Bauer; organic phosphates studied for availability to crops, by DeTurk and J. C. Anderson; liming reduces leaching of soil potassium, by DeTurk, R. H. Bray, L. C. Olson, and S. R. Dickman; and growing conditions affect chemical composition of crops, by DeTurk and Bauer.

[Soil investigations by the South Dakota Station] (*South Dakota Sta. Rpt. 1939, pp. 5, 6, 7, 15, 16*).—This report contains notes on the fertilizer needs of South Dakota soils and the effect of organic matter on soils, both as studied by J. G. Hutton and L. F. Puhr; and the geological distribution of selenium, greenhouse studies on soils and plants, and laboratory studies on forms of selenium in soils and rocks, all by A. L. Moxon, O. E. Olson, and W. V. Searight.

Color photography in soil studies, L. A. Brown and M. N. Langley (*Colorado Sta. Tech. Bul. 26 (1939), pp. 7, figs. 2*).—Advantages and disadvantages of the use of the process of color-film photography producing single positive transparencies by reversal of the negative are pointed out, and the nature and costs of the equipment needed are indicated, together with the cost of commercially made 6- by 8-in. color prints.

[Soil Survey Reports, 1932, 1933, and 1935 Series] (*U. S. Dept. Agr., [Soil Survey Rpts.], Ser. 1932, Nos. 36, pp. 65, pls. 5, figs. 2, map 1; 37, pp. 42, pls. 2, figs. 3, map 1; 39, pp. 43, figs. 2, map 1; 1933, Nos. 25, pp. 98, figs. 45, maps 7; 27, pp. 43, figs. 3, map 1; 1935, Nos. 10, pp. 43, figs. 2, map 1; 11, pp. 42, figs. 2, map 1*).—These surveys were made in cooperation with the Indiana, Michigan, Iowa, and Minnesota Experiment Stations and the Universities of Nebraska and Georgia, respectively: 1932, Nos. 36, Washington County, Ind., J. T. Miller et al., 37, Schoolcraft County, Mich., Z. C. Foster et al., and 39, Marion County, Iowa, C. L. Orrben and W. J. Leighty; 1933, Nos. 25, the Red River Valley area, Minn. (reconnaissance), C. C. Nikiforoff et al., and 27, Kanabec County, Minn., P. R. McMiller et al.; and 1935, Nos. 10, Sarpy County, Nebr., T. E. Beesley and T. K. Popov, and 11, Toombs County, Ga., A. E. Taylor et al.

Composition, rating, and conservation of Willamette Valley soils, W. L. Powers, J. S. Jones, and C. V. Ruzek (*Oregon Sta. Bul. 365 (1939), pp. 38, figs. 11, maps 2*).—The Willamette Valley soils are here classified in three groups: (1) The recent stream-bottom soils, usually unleached and adequately supplied with lime (2) the mature alluvial valley-filling soils moderately acid and somewhat deficient in lime, and (3) the old residual hill lands, generally distinctly acid and low in lime.

A deficiency of sulfur was found in many of the basaltic soils. The peat land was found relatively rich in this element. Most soils with less than 350 lb. of sulfur to the plow depth of an acre responded to sulfates when applied to legumes. Soils low in total nitrogen were usually low in nitrate-supplying power and gave definite response to nitrogenous fertilizers. The ratio of potassium to calcium was found to increase with soil age, the soils losing calcium faster than they do potassium. The magnesium content is generally about half as much as the total lime content. The phosphate-supplying power was lower in the acid hill lands. Analyses of old cropped or eroded soils when compared with those of native sod land showed definite reduction in plant nutrients and increase in acidity.

A productivity rating for the soils of the area is given, together with a preliminary fertility balance sheet for the valley, and suggestions for conservation of soil fertility, including preliminary notes on "minor element" needs.

Reliability of the proposed suction method of determining the moisture equivalent of soils, R. M. PINCKNEY and F. J. ALWAY. (Minn. Expt. Sta.). (*Soil Sci., 48 (1939), No. 5, pp. 403-411*).—Using 113 Minnesota soils of a wide range of moisture equivalent, nitrogen content, and pH value, the authors compared the Bouyoucos suction (E. S. R., 74, p. 161) with the Briggs-McLane centrifugal method (E. S. R., 26, p. 421).

"Though the relationships found are in general agreement with those reported by Bouyoucos, they do not fully support his conclusions as to the reliability and general desirability of the method. With loams and soils of still finer texture the suction value averaged about one-tenth higher than the moisture equivalent, whereas with the individual soils it varied from practically equal to one-third higher. With the sands of coarsest texture it was twice as high, or still higher, and with soils intermediate between these and loams it was generally intermediate but widely variable. Duplicate determinations by the suction method were found much less concordant than those with the centrifuge. Only where a moisture equivalent centrifuge is not available does the use of the suction method appear desirable, and the values so obtained should be referred to by some other designation than moisture equivalent."

The colloidal constituents of California soils, W. P. KELLEY, W. H. DORE, A. O. WOODFORD, and A. M. BROWN. (Univ. Calif.). (*Soil Sci., 48 (1939), No. 3, pp. 201-255, figs. 5*).—The colloids of the Yolo and the San Joaquin family of soils (San Joaquin, Ramona, Placentia, Hanford, and Tujunga) were found to contain substantial quantities of nonexchangeable Mg. The Maxwell clay was exceptionally high in Mg. Base-exchange capacity, however, was not proportional to Mg content.

The $SiO_2:Al_2O_3$ ratio of the Yolo and of certain samples of the San Joaquin series was approximately 4, whereas that of the Sierra, Keefers, and certain Redding profiles approached 2. This ratio in most of the other samples lay between 2 and 4. In the Maxwell it was found to be almost 5. "Although there is a rough proportionality between $SiO_2:Al_2O_3$ ratio and base-exchange capacity, the correlation is not high, and in certain cases it appears to be negative."

The dehydration curves of the Yolo and Maxwell clays resembled those of the bentonitic clays, and the curves for the Sierra, Keefers, and certain Redding samples were similar to the curves for kaolinite and halloysite. A relatively good correlation between water loss at 100° and 150° C., respectively, and base-exchange capacity was found.

Their optical properties showed that these colloids were preponderantly crystalline. The birefringence ($\gamma-\alpha$) was approximately 0.02 in the Yolo and in the B_2 horizon of the Redding from Palermo. The birefringence of the Tujunga, Hanford, Ramona, Placentia, San Joaquin, and Madera clays was comparatively high. Those colloids with low $SiO_2:Al_2O_3$ ratios also showed low birefringence. Quartz was found in every sample, and rutile and zircon were tentatively identified in several samples. Saturation with Ca, Mg, K, or Na appeared to have but little influence on the optical properties of these colloids.

X-ray analysis showed that every colloid studied is definitely crystalline and composed chiefly of clay minerals of different types. The Yolo and Maxwell clay colloids are predominantly montmorillonitic; the Sierra, Redding, Vina, and Keefers colloids are preponderantly kaolinitic; and the San Joaquin and Hanford colloids are largely composed of the "x" (muscovitelike type) clay mineral, similar to illite. Certain samples from other soil types were found to be composed of mixtures of these clay minerals.

Minerals present in soil colloids, I, II. (U. S. D. A.). (*Soil Sci., 48 (1939), No. 3, pp. 257–271, pls. 2, fig. 1; pp. 273–279, fig. 1*).—The first two papers of this series are mainly devoted, respectively, to methods adapted to soil work and to an application of these methods to 15 soils of the continental United States.

I. *Descriptions and methods for identification*, S. B. Hendricks and L. T. Alexander.—The authors found that the most common components of soil colloids are kaolin minerals (kaolinite or halloysite), hydrous micas, montmorillonites, quartz, goethite, and hematite, which can be identified and their amounts estimated by simultaneous use of suitable chemical analyses, X-ray observations, and behavior upon heating. X-ray measurements, though desirable, are not indispensable, and the methods, although somewhat inadequate, for identification of clay minerals can readily be carried out in most soil laboratories.

II. *Estimation in some representative soils*, L. T. Alexander, S. B. Hendricks, and R. A. Nelson.—Kaolinite and free oxides and hydrous oxides of iron were the predominant components of the Red Podzolic soils examined. Gray-Brown Podzolic soil colloids contained these minerals associated with appreciable amounts of hydrous mica. Single examples of colloids separated from soils of the Chernozem, Prairie, and Desert group groups were studied.

The effect of free iron oxide removal on some properties of soil colloids, S. J. Toth. (N. J. Expt. Stas.). (*Soil Sci., 48 (1939), No. 5, pp. 385–401, fig. 1*).—The deferrated colloids lost more silica and sesquioxides during electrodialysis than did the untreated colloids. The composition of the sesquioxides varied, but the amount of aluminum electrodialyzed from the deferrated residues was always greater. The removal of the free oxides lowered the ultimate pH of the colloids without materially affecting the cation-exchange capacity at pH 7.0. The removal of the free oxides decreased the adsorption of chloride and phosphate ions. Indications that soil colloids may adsorb phosphate ions without altering the cation-exchange capacity were given by deferrated Colts Neck and Sassafras colloids. The neutralization curves of the deferrated colloids were similar to the curves for the original colloids, but the residues possessed a lower buffer capacity. In general, the release by electrodialysis of Ca and Ba from original and deferrated colloids was the same. Of magnesium, however, less was released per unit time from the deferrated colloids by electrodialysis.

Iodine in Texas soils, G. S. Fraps and J. F. Fudge (*Texas Sta. Bul. 579 (1939), pp. 25, fig. 1*).—The iodine content of 362 samples of surface soil, representing 146 soil types in 64 upland and 13 alluvial soil series was determined. Most of the soils were well supplied with iodine, and there was no evidence of a deficiency. The iodine content of the soils by regions ranged from 1.7 p. p. m. for the Central Basin to 11.3 p. p. m. for the Edwards Plateau.

Heavy-textured soils contained more iodine than light-textured soils. Clays and clay loams contained about the same quantities, but sandy loams contained less than half and sands about one-fifth as much iodine as the clays. A high iodine content was usually found associated with a high content of acid-soluble lime, and, to a much less marked and regular degree, with a high content of total phosphoric acid. In general, the iodine content of the soil increased with an increase in depth. The 0–7 in. layer averaged 4.7 p. p. m., 7–14 in. 6.5 p. p. m., 14–24 in. 8.1 p. p. m., and 24–36 in. 7.1 p. p. m. The general average iodine content of Texas soils was found as high as in most other regions, and higher than in those from goitrous regions.

Soil genesis from andesite in Grenada, British West Indies, F. Hardy and G. Rodrigues (*Soil Sci., 48 (1939), No. 5, pp. 361–384, fig. 1*).—By means of a

combination of methods, including chemical analysis of whole materials and colloidal clay components, mineralogical examination under the microscope, the construction of mineral dehydration curves, the determination of some physical and chemical soil constants, and dye adsorption tests, including an improved alizarin test for gibbsite and some other tests (diamine sky blue and Janus red) for hydrous iron oxides and clay minerals, it was found possible to distinguish and to determine quartzose silica and combined silica, free (gibbsitic) alumina and combined alumina, magnetite, and hydrous iron oxides. The separate determination of the free oxides made it possible to estimate the amounts of secondary aluminosiliceous minerals present in the several materials, and so revealed their identity as kaolins (probably metahalloysite chiefly, with some kaolinite).

The formation of primary Laterite from the parent igneous rock and of pink earth and red earth from the Laterite is described and discussed. A new theory to account for gibbsite silication as an essential process in the transformation of primary gibbsitic Laterite into secondary kaolinic red earth is based on colloid chemical interactions between descending acidic water and alkaline silica solutions comprising ground water, the level of which fluctuates within the zone of intermittent saturation coinciding with the pink earth layer. The formation of red earth from pink earth involves no further changes other than the redistribution of hydrous iron oxides, their completed oxidation, partial dehydration, and equalization.

Properties of soils from North American Arctic regions, I. C. Feustel, A. Dutilly, and M. S. Anderson. (U. S. D. A.). (*Soil Sci., 48 (1939), No. 3, pp. 183–199, pl. 1, fig. 1*).—A group of 37 soils and soil materials collected from the Arctic region of northeastern North America, comprising both inorganic and predominantly organic materials, showed lack of profile development as well as certain chemical and physical characteristics indicative of extreme immaturity.

Mechanical analyses of the samples examined showed that a large part of the materials consisted of particles in the coarser size groups. The clay content was generally small, only 3 of the samples having as much as approximately 20 percent and a majority of the remainder having less than 5 percent.

The wide range of carbon: nitrogen ratios in the organic materials was comparable to the variation found in peats and mucks of the United States. The carbon contents, calculated on an ash-free basis, however, appear to be somewhat lower than those of peat samples of this country.

Ash analyses indicated no striking differences, except for low contents of sulfur, as compared with ashes of peats and mucks from temperate regions.

Examinations of the colloids extracted from a group of the mineral soils show silica: base ratios of 5.5 or lower and accompanying silica: alumina ratios of 3: 3.7. These and other factors are considered indicative of only a slight chemical alteration. Hydrous mica was shown by X-ray and heating curves to be the dominant clay mineral present.

Cation exchange properties of certain forest soils in the Adirondack section, R. F. Chandler, Jr. ([N. Y.] Cornell Expt. Sta.). (*Jour. Agr. Res. [U. S.], 59 (1939), No. 7, pp. 491–505, figs. 7*).—On soils of similar geological origin, the sugar maple-beech-yellow birch forest type produced a soil type which, in the surface layers, was less podzolized, had a higher pH value, and a larger percentage base saturation than soil profiles beneath stands of the red spruce-sugar maple-beech type, or the red spruce type. The differences between the latter two types were small. The data obtained indicate that these differences were associated with the calcium content of the foliage of the

trees. A high correlation between total exchange capacity and percentage loss on ignition was shown. Percentage base saturation and pH value were highly correlated when soils of similar organic matter content were compared.

The apparent pK values of the various horizons indicated that the soil organic matter had a lower apparent pK value than that of the mineral soil. The values were somewhat higher for the hardwood profiles, indicating that weaker acids were involved. It is pointed out that the lower apparent pK value of organic matter, and hence the higher percentage base saturation at a given H-ion concentration, explain why it was possible to have a lower pH value in the B_1 horizon than in the A_1 horizon of a humus Podzol profile.

Wilting coefficient and wilting percentage of three forest soils of the Duke Forest, W. H. DUNCAN. (Univ. Ga.). (*Soil Sci., 48 (1939), No. 5, pp. 413–420*).—Moisture equivalent values were found to be higher in sieved than in unsieved soil in the Georgeville and Orange soils. From the determinations reported, moisture equivalent values for the lower soil horizons appear to be directly correlated with colloid content. Organic content appears to be directly correlated with the values for the surface horizons. Wilting percentages, though much lower, were found to follow the general trend of the moisture equivalent values. The wilting percentage values appeared to be conditioned by the same factors that influence the moisture equivalent values. The ratio of moisture equivalent to wilting percentage was found to vary from 1.57 to 5.65. Wilting coefficient values were found to vary considerably from those of the wilting percentage.

The influence of cropping practices on some physical and chemical properties of soil, F. MOSER. (S. C. Expt. Sta. and U. S. D. A.). (*Soil Sci., 48 (1939), No. 5, pp. 421–431*).—In studies on the effects of various cropping systems on the erodibility of soils of plats at Tigerville, Duncan, and Greer, S. C., certain soil-conserving legume crops in a rotation reduced soil and water losses during the actual growing period of the legumes and also made the soil less susceptible to erosion during the succeeding year when cultivated crops were grown. A comparison of such physical and chemical properties as organic matter, humus, aggregation, volume weight, saturation capacity, field moisture capacity, suspension percentage, dispersion ratio, percolation, and porosity showed considerable variations between soil-conserving rotations and soil-depleting rotations.

Growth of millet in quartz sand and in sand-soil mixtures, P. L. GILE. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 59 (1939), No. 8, pp. 619–633*).—In 66 experiments, involving 46 soil samples, millet yielded 56 percent more, on an average, in sand-soil mixtures containing 1 percent of soil colloids than in pure quartz sand. Wheat, however, in 4 comparisons, gave about the same yield in each medium. The beneficial effect of soil admixtures on the yield of millet did not increase as the quantity of soil added was increased above that supplying 1 percent of soil colloids. A soil admixture supplying less than 0.2 percent of soil colloids markedly increased the yield.

The observed differences in yield were apparently not due to effects of added soil on the water-holding capacity of the medium, to the supplying of trace requirement elements, to such growth-inhibiting components in the sand as could be extracted with 10 percent nitric acid, nor to modification of the reaction of the medium as a whole. Small quantities of peat, activated charcoal, iron gel, and freshly precipitated silica gel, when mixed with quartz sand, produced an increase in yield and a modification in root growth similar to those produced by soil.

It is suggested that the H-ion concentration affecting growth is that of the water films immediately contiguous to the roots, and that this is probably

not shown by a sample of the whole medium. It is believed probable that when a physiologically acid fertilizer is used an injurious acidity is developed in sand cultures in films contiguous to the roots. In sand-soil mixtures the films are thought to be less acid, because of the buffering effect of soil, and the yield to be consequently greater. It is further noted that, when a physiologically neutral fertilizer is used, sand-soil mixtures should yield more than pure sand, owing to the effect of soil colloids in maintaining the availability of iron.

Soil conservation, H. H. BENNETT (*New York and London: McGraw-Hill Book Co., 1939, pp. XVII+993, figs. [436]*).—This book points out and illustrates by many examples the present impoverishment and destruction of soils by misuse and neglect, emphasizes the relation of erosion and water loss by run-off to control of flood and sedimentation damage, and plainly sets forth the social and economic problems inevitably consequent upon the depletion still in progress. Soil defense and reclamation and a national conservation program are also given prominence.

Part 1, soil erosion, takes up the problem in the United States; erosion and civilization; results of erosion; processes and types of erosion; rates of erosion and run-off; relation of physical and chemical properties of soils to the erosion problem; climate and soil erosion; infiltration in relation to run-off, the erosion process, and the utilization or rainfall; relation of erosion to crop yields; relation of erosion to vegetative changes; sedimentation; mass movement an important process of soil wastage; geology and soil erosion; and relation of entomology to erosion.

Part 2, soil conservation, deals with a national program of soil conservation; agronomic practices in soil and water conservation; farm and range plants useful for erosion control and water conservation; the place of forestry in soil and water conservation; contouring; terracing; run-off disposal channel ways and outlets; subsoiling and other subsurface tillage operations; gully prevention and control; control of erosion on highways; small dams for water storage; erosion of stream banks; water spreading; wildlife and soil conservation; soil conservation and flood control; Atlantic and Gulf Coastal Plain region; southern Appalachian region; northern Appalachian and New England area; central prairie and eastern timbered border region; Ozark highlands; the Great Plains; Edwards Plateau, Fort Worth prairie, and cross timbers area; Colorado River Basin region; Pacific Northwest region; Pacific Southwest region; early efforts towards erosion control; erosion problems in foreign countries; research, an arm of coordinated land use; and soil conservation surveys.

Erosion losses from a 3-day California storm, J. G. BAMESBERGER (*U. S. Dept. Agr., Soil Conserv. Serv., [1939], pp. 23, figs. 32*).—The extent of erosion in six southern California counties from a storm extending from February 28 to March 3, 1938, was measured, and the type of treatment of the land, the kind and condition of cover, slope, soil type, condition of soil, and previous conditions of erosion were recorded. Measurements of the size of new gullies, erosion in the old gullies, the area covered by deposits, the depth of the overwash, and the extent of landslips were also made, including measurements on gullies and deposition in the Las Posas project area and observations of landslips, particularly in the La Habra area. The average soil loss on five areas surveyed was 6.7 cu. yd. per acre where erosion control was practiced and 65.9 cu. yd. where not practiced. A pictorial section follows the report.

Fertilizer research [of the Bureau of Agricultural Chemistry and Engineering] (*U. S. Dept. Agr., Bur. Agr. Chem. and Engin. Rpt., 1939, pp. 54–63*).—

Results are briefly presented for research on the preparation, composition, and use of mixed, potash, and phosphate fertilizers, nitrogenous fertilizer materials, and biochemical nitrogen fixation.

Fertilizer and liming practices recommended for South Carolina, H. P. COOPER (*South Carolina Sta. Cir. 60 (1939), pp. 23*).—This publication points out that South Carolina farmers have been paying about $1,000,000 annually for sand and other inert fillers because of their purchase of low-grade fertilizers, calls attention to a revision of the State fertilizer law to require 16 percent minimum plant-food content, and further calls attention to the acidity of South Carolina soils, such that the State has an annual lime requirement of some 500,000 tons. Local liming recommendations and approximate pH optima for numerous crops are given, together with suggestions as to time and method of limestone application, sampling of soils for lime and fertilizer requirement tests, etc.

Rates, dates of applying nitrogen, R. KUYKENDALL (*Miss. Farm Res.* [*Mississippi Sta.*], *2 (1939), No. 12, p. 8*).—The 19-yr. results here noted show that increased cotton yields become considerably smaller after the nitrogen passed the 30 lb. per acre rate. Sodium nitrate, ammonium sulfate, and cyanamide increased cotton yields more when applied in March but produced very economical increases even when applied in November on loam land.

Solubilization and movement of organic forms of nitrogen in the soil, V. SADASIVAN and A. SREENIVASAN (*Soil Sci., 48 (1939), No. 3, pp. 161–174, figs. 5*).—The authors found some of the nitrogen content of organic materials to be converted, during decomposition in the soil, into dispersed or dissolved organic substances which are partly flocculated by lime, are produced more abundantly in swamp soils than in merely moist soils, are formed to a much less extent in the presence of sodium chloride, and are transported, to some degree, from one layer of soil to another.

Effect of chloropicrin fumigation on nitrification and ammonification in soil, F. L. STARK, JR., J. B. SMITH, and F. L. HOWARD. (R. I. Expt. Sta.). (*Soil Sci., 48 (1939), No. 5, pp. 433–442, figs. 4*).—Low dosages of chloropicrin were found to have little effect on nitrate formation, but as the dosage was increased nitrification was inhibited. The length of the inhibition period was dependent on the dosage of chloropicrin. In none of the experiments was ammonification inhibited, and in some instances, therefore, the inhibition of nitrification resulted in an accumulation of ammonium nitrogen. The total amount of nitrogen made available for plant growth was not materially increased except where high dosages of chloropicrin were used. In view of the data obtained, the increases in plant growth obtained by treating the soil with low dosages of chloropicrin cannot be accounted for solely by the hypothesis that more nitrogen was made available for plant growth.

Possible losses of nitrogen from acid soils through the decomposition of nitrites, G. S. FRAPS and A. J. STERGES. (Tex. Expt. Sta.). (*Soil Sci., 48 (1939), No. 3, pp. 175–181*).—When 100 p. p. m. of nitrogen were added to an acid soil in the form of sodium nitrite there was an average nitrogen loss of 47 p. p. m. in the first 2 days, 55 in 4 days, and 63 p. p. m. in 8 days. Some nitrate was formed, from 15 to 44 p. p. m. in about two-thirds of the experiments. The average losses when calcium carbonate was added with the nitrite were 5, 8, and 9 p. p. m. in 2, 4, and 8 days, respectively. There was no loss of nitrogen which could be ascribed to formation and decomposition of nitrites during the nitrification of ammonium sulfate in 23 of 24 soils which require additions of calcium carbonate for good nitrification, but there was some loss with 1 of the subsurface soils, indicating that in rare cases nitrites may be

formed during the nitrification of ammonium sulfate and decomposed chemically in acid soils with loss of nitrogen.

Calcium metaphosphate fertilizers: Chemical composition and properties, W. H. MacIntire, L. J. Hardin, and F. D. Oldham. (Tenn. Expt. Sta.). (*Indus. and Engin. Chem., 29 (1937), No. 2, pp. 224–234, figs. 8*).—Properties of a calcium metaphosphate preparation produced by passing the hot combustion products from elementary phosphorus into phosphate rock were tested with a view to the possible use of this form of phosphate as fertilizer. Absorption by suspensions of soils, subsoils, and ferric and aluminum oxides appeared decidedly greater than that of orthophosphate. The quenched melt showed a solubility higher than that of the air-cooled material.

Retention of some phosphorus compounds by soils as shown by subsequent plant growth, J. P. Conrad. (Calif. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *59 (1939), No. 7, pp. 507–518, figs. 3*).—Each phosphorus compound in solution was allowed to percolate through a stack or column of three pots containing dry soil deficient in phosphorus. The volume of solution was sufficient to wet all the soil, but without great excess.

Yolo subsoil showed little retention of hypophosphites, but somewhat more for phosphites. The phosphorus of metaphosphoric acid reached the second pot, but that of the pyro- and orthophosphates was held in the top pots. The Aiken soil for the most part held each inorganic compound more strongly than did the Yolo. The Yolo soil retained the phosphorus of phytin in the top pot but held back the glycerophosphates only slightly. The Aiken soil retained the phosphorus of nearly all these organic compounds as well as that of sodium nucleate, in the respective top pots. Triethyl phosphate, held back somewhat by both soils, was more strongly retained by the Yolo and was more toxic on the Aiken.

The phosphites and hypophosphites were toxic to milo. The meta-, pyro-, and orthophosphates (if not too concentrated) and the glycerophosphates were beneficial to both soils. Phytin was beneficial on the Yolo soil and sodium nucleate on the Aiken soil.

The possible mechanisms by which the various compounds were retained, including chemical precipitation in the soil, either adsorption or anionic exchange or both and chemical transformations (during the actual process of percolation) to some other forms retained by the soil, are discussed.

Use of T. V. A. phosphates on pastures: A progress report, 1938–1939, based upon field experiments, W. W. Woodhouse, Jr. (*North Carolina Sta. Agron. Inform. Cir. 120 (1940), pp.* [*1*]+*3*).—In a single year's work plats receiving no treatment being taken as the 100 percent basis, the triple superphosphate gave an average yield of 148 percent, calcium metaphosphate 158, and fused phosphate 154 percent. When limestone was also applied, the corresponding yields were 164, 170, and 171 percent. A medium rate of both phosphate and limestone seemed most satisfactory. All three sources of phosphate appeared effective, lespedeza and white clover being especially responsive.

Calcium arsenate safely used for poisoning weevils, C. Dorman and R. Coleman (*Miss. Farm Res.* [*Mississippi Sta.*], *2 (1939), No. 12, p. 8*).—No crop was injured by calcium arsenate in applications up to 200 lb. per acre. Germination was not hindered and seedlings were not injured by applications up to 400 lb. per acre. The soils most sensitive to arsenate toxicity were those containing the least clay and having the lowest iron, aluminum, calcium, and magnesium contents. The smaller applications of calcium arsenate (100 lb. per acre, for example) seemed in some instances beneficial, the calcium neutralizing some acidity and serving as a nutrient, while the arsenate, in small quantities, appeared to stimulate soil bacteria.

Molybdenum as an essential element for higher plants, D. I. ARNON and P. R. STOUT. (Univ. Calif.). (*Plant Physiol., 14 (1939), No. 3, pp. 599–602, fig. 1*).—In tomato seedlings grown in nutrient solutions containing nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, boron, manganese, zinc, and copper, but with rigid exclusion of any traces of molybdenum, the lower leaves developed "a distinct mottling different from any other deficiency symptom yet observed in the tomato." This is shown in photographs. Marginal necrosis, involution of the laminae, abscission of the flowers without setting fruit, and other symptoms appeared later. These symptoms were prevented by 1 part in 100,000,000 of molybdenum added as molybdic acid. Ordinary distilled water and C. P. chemicals were found sometimes to contain molybdenum enough to prevent the deficiency symptoms. Applying a solution containing 0.05 p. p. m. of molybdenum as molybdic acid to the aerial parts of the plant only also relieved the symptoms. No one of 19 other elements took the place of the molybdenum.

AGRICULTURAL BOTANY

Proceedings of the thirty-eighth meeting of the North Carolina Academy of Science (*Jour. Elisha Mitchell Sci. Soc., 55 (1939), No. 2, pp. 236, 238, 239, 240, 242, 243, 244*).—Abstracts of interest to agricultural botany include The Effect of Manganese and Copper on Tobacco, by W. B. Rankin and L. F. Williams; Distribution and Development of Tobacco Roots, by L. J. Gier; Sex Chromosomes in Plants—A Cytological Hoax, by H. W. Jensen; The Distribution of the Fiber Population on the Cotton Seed, by J. H. Moore; Studies of the Fruiting Habit of the Peanut, by G. K. Middleton and P. H. Harvey; The Manner in Which an Excess of Carbon Dioxide Reduces the Intake of Water by Plants, by P. J. Kramer; The Cytology of a New Species of the Plasmodiophoraceae [*Octomyxa achlyae*], by A. J. Whiffen; and Vegetative Regeneration in the West Coast Manzanitas, by J. E. Adams.

Protection of herbarium specimens, C. S. SEMMENS (*Science, 90 (1939), No. 2348, p. 624*).—The use of transparent, flexible sheets of synthetic material of cellophane type bound around the edges with tape put on by a low-cost binding device is described for covering and preserving herbarium specimens.

Studies with the agar cup-plate method, I, III (*Jour. Bact., 38 (1939), No. 5, pp. 525–537, 539–547, figs. 5*).—Part 1 of this series, by S. B. Rose and R. E. Miller, deals with a standardized agar cup-plate technic. In testing antiseptics by the agar cup-plate method it was found that various factors may influence results. The standardized technic described was developed and proved comparatively simple, yielding consistent results with the three representative antiseptics tested, viz, phenol, mercuric chloride, and crystal violet. In part 3, the influence of agar on mercury antiseptics, by R. E. Miller and S. B. Rose, agar exerted little or no effect on the antiseptic properties of the mercury compounds tested (metaphen, merthiolate, mercuric chloride, and mercurochrome) and their antiseptic potency was not directly related to the mercury content.

A modified fermentation tube, P. B. COWLES (*Jour. Bact., 38 (1939), No. 6, pp. 677, 678, fig. 1*).—The essential features consist of a double U-tube of Pyrex glass with both ends open, the great advantage being that it fills when dropped into liquid, or, if in an empty vessel, it fills when fluid is poured in. When once filled, both arms of the inverted U-tube serve as traps for any gas evolved.

Proceedings of local branches of the Society of American Bacteriologists (*Jour. Bact., 38 (1939), Nos. 5, pp. 595, 598; 6, pp. 679, 680, 682*).—Abstracts of the following papers are of botanical interest: Auxin Production by Soil Micro-

organisms, by J. L. and E. Roberts (Purdue Univ.); Bacteriological Observations—From Wheat to Bread, by G. K. Ashby; The Use of Quinhydrone Electrode for Correlating Final H-ion Concentration and Pigmentation of Actinomycetes Growing on Agar, by J. E. Conn, and Microbiological Flora of Pulp, Paper, and Paperboard, by J. R. Sanborn and R. A. Gillotte (both N. Y. State Expt. Sta.); Morphology and Growth of Thermophiles During Fermentation of Cellulose, by T. S. Polansky and R. W. Stone (Pa. State Col.); and The Use of Spores as Antigenic Material in the Serological Differentiation of Species Within the Genus *Bacillus*, by C. Lamanna (Cornell Univ.).

Nutrient requirements of butyric acid-butyl alcohol bacteria, R. W. Brown, H. G. Wood, and C. H. Werkman. (Iowa Expt. Sta.). (*Jour. Bact., 38 (1939), No. 6, pp. 631–640*).—An ether-soluble extract of "Difco" yeast extract and of Speakman's salts proved essential for growth in media containing $(NH_4)_2SO_4$ as N source, while a number of substances known to be growth factors for organisms did not replace the extract of yeast extract. In the presence of purified vitamin-free hydrolyzed casein as N source and glucose as C source, phosphates alone were essential for growth. Other inorganic salts were undoubtedly present in the casein, but no ether-soluble stimulant could be obtained or demonstrated in it, the growth-promoting property apparently being a function of the amino acids. Glucose was dissimilated with the formation of normal products in media containing $(NH_4)_2SO_4$ or casein hydrolysate as a N source when the other essential nutrients were present.

The production and utilization of lactic acid by certain propionic acid bacteria, A. S. Phelps, M. J. Johnson, and W. H. Peterson. (Wis. Expt. Sta.). (*Biochem. Jour., 33 (1939), No. 10, pp. 1606–1610, fig. 1*).—In studying the influence of certain cultural conditions it was found that *Propionibacterium pentosaceum* produced only $l(+)$lactic acid from glucose and arabinose and *P. technicum* only $l(+)$lactic acid from glucose. These species and *P. shermanii* failed to racemize optically active lactic acid. The growth rates on the optical isomerides of lactic acid varied in the order $d(-) < l(+) < dl$. The ultimate level of growth was the same in each case. The presence of both $l(+)$ and $d(-)$lactic dehydrogenases in these organisms was proved, the $l(+)$enzyme possessing the greater activity.

Supplement to root nodule bacteria and leguminous plants, E. B. Fred, I. L. Baldwin, and E. McCoy (*Madison: Univ. Wis. Press, 1939, pp. 40*).—Due to the great economic and scientific interest and importance of the leguminous problem, it was deemed advisable to publish the available references to the recent work in this field, as well as a few important references inadvertently omitted from the original monograph (E. S. R., 68, p. 755). The index is supplemented by a list of the scientific names of all the plants cited in the original monograph, and by an author index, both prepared by O. N. and E. K. Allen. Errata in the original publication are also noted.

Surface sterilization of nodules with calcium hypochlorite, J. K. Wilson and T. Punyasingha. (Cornell Univ.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 12, pp. 1016–1019*).—Detailed procedures are given for a calcium hypochlorite sterilization method, said to leave the cells in the center of the nodules full of viable bacteria from which pure cultures of *Rhizobium* may be obtained while traces of the hypochlorite solution adhering to the nodule soon disappear and leave no toxic residue. From the data presented it is believed that the interiors of a vast majority of well-developed, clean, healthy-appearing nodules contain only the legume bacteria, and that perhaps most organisms previously reported as internal contaminants may have resulted from ineffective sterilization of the nodule surface.

Bacteria as indicators of soil fertility, H. Nicol (*Chron. Bot., 5 (1939), No. 1, pp. 13, 14*).—This discusses in particular *Bacterium globiformis* (= *Achromobacter globiforme*), thought by Conn (E. S. R., 60, p. 420) to indicate soil fertility by its presence. In view of the findings of Taylor (E. S. R., 80, p. 736) and Taylor and Lochhead (E. S. R., 79, p. 21; 82, p. 448), in work embracing 90 different Canadian soils in which only 17 out of 106 strains of this organism were found capable of utilizing nitrate, the author concludes that further search for a dependable indicator is necessary.

The defensive mechanism in orchid mycorrhiza, A. Burges (*New Phytol., 38 (1939), No. 3, pp. 273–283, pl. 1, fig. 1*).—In orchids, mycorhizal-type infection is usually limited to the roots, and two types of resistance are recognized, viz, a mechanical one in the form of wall thickenings and cuticularization and a protoplasmic resistance. In the latter case there is a complete break-down of the fungus, during which histological changes are observed which have been correlated with a loss of vitality in the endophyte. Its vitality at different stages was tested by dissecting out the hyphae with a micromanipulator and transferring them to agar cultures and also by plasmolysis tests. The existence of a toxic substance in the tubers was confirmed, and by means of micropipettes a toxic material was isolated from host cells in which the fungus was undergoing digestion.

The Aspergillus nidulans group, C. Thom and K. B. Raper (*Mycologia, 31 (1939), No. 6, pp. 653–669, figs. 6*).—This group is divided into five species (recognized or described as new), primarily on the character of the ascospores. Differences in colony characters are also correlated with differences in ascospore pattern and further substantiate the validity of the present separation. A new variety, *A. nidulans latus*, is described, and a white mutant, *A. nidulans mut. albus* Yuill, is accepted.

Histological studies of the Boletaceae and related genera, R. P. Elrod and D. L. Blanchard (*Mycologia, 31 (1939), No. 6, pp. 693–708, figs. 2*).—The results of histological studies are reported for the pilei of over 60 species of Boletaceae and a few related species, such as *Gomphidius maculatus*, the Paxilli, and *Phylloporus rhodoxanthus*. A bibliography of 23 references is included.

New species and taxonomic changes in the Hypodermataceae, L. R. Tehon (*Mycologia, 31 (1939), No. 6, pp. 674–692, figs. 6*).—New taxonomy is included for the fungus genera *Clithris*, *Bifusella*, *Hypoderma*, *Epidermella*, and *Lophodermium*. There is a bibliography of 16 references.

Gentes Herbarum.—Arts. 23–25, Some cultivated plants, R. T. Clausen (*Ithaca, N. Y.: Bailey Hortorium, 1940, vol. 4, No. 8, pp. [2]+287–315, figs. 14*).—The following are included: Arts. 23, On the Status of *Robinia hispida* [with descriptions of the varieties *fertilis* and *typica*] (pp. 287–292); 24, A Review of the Cyanastraceae [including a key to the species of *Cyanastrum*] (pp. 293–304); and 25, Various Rare or Unusual Cultivated Plants [including *Syngonium podophyllum*, *Spathiphyllum cannaefolium*, *S. floribundum*, *Arabis bellidifolia*, *Draba aizoon*, ×*Potentilla tormentillo-formosa*, and *Viola jooi*] (pp. 305–315).

Two new species of Ranunculus § flammula, L. Benson and A. Carter (Univs. Ariz. and Calif.). (*Amer. Jour. Bot., 26 (1939), No. 7, pp. 555–557, fig. 1*).—The following are described: *R. oresterus* n. sp. and *R. alveolatus* n. sp. A key to the species in the subsection Flammulae is included.

Edapho-vegetational relations in Ravenel's Woods, a virgin hemlock forest near Highlands, North Carolina, H. J. Oosting and W. D. Billings (Univ. Nev. et al.). (*Amer. Midland Nat., 22 (1939), No. 2, pp. 333–350, figs. 5*).—

This forest is of two types, the first occurring in depressions and along streams, being characterized by the domination of the secondary tree and shrub synusiae by *Rhododendron maximum* almost to the exclusion of other species, and the second, occurring in the interstream low ridges, being typified by the absence of *Rhododendron* and its replacement in the secondary tree layer by several deciduous species, and in the shrub stratum by *Polycodium* (=*Vaccinium*) *stamineum*. Considering all the detailed evidence given regarding vegetation and soils, it is concluded that the hemlock forest of both these types in Ravenel's Woods is climax, and consequently that it is most likely a concrete example of a relict association-segregate of the Tertiary mixed mesophytic forest. The hemlock community, through its reactions on the environment, maintains the moist, porous, acid soil which enables its characteristic species to reproduce, thus continuing the type as a self-perpetuating relict association segregate of an ancient climatic climax.

Flora of the Great Smokies, H. M. JENNISON. (Univ. Tenn.). (*Jour. Tenn. Acad. Sci., 14 (1939), No. 3, pp. 266–298, figs. 26*).—"In this sketch, flora is being treated in the broadest sense of the word. Thus the reader will find a little about the more conspicuous elements of the mountain vegetation from the slime-molds to the sunflowers—but the wild flowers and the trees receive a well-deserved and most extended treatment. The area of central interest is the Great Smoky Mountains National Park."

Availability seasons of some Tennessee game-food plants, L. WING (*Jour. Tenn. Acad. Sci., 14 (1939), No. 3, pp. 325–327*).—Phenological data on fruits, nuts, or seeds of some 32 plants.

A phytosociological study of a Nyssa biflora consocies in southeastern Louisiana, T. F. HALL and W. T. PENFOUND (*Amer. Midland Nat., 22 (1939), No. 2, pp. 369–375, figs. 5*).—The virgin black gum swamp analyzed at Pearl River, La., includes a total of 14 species of which only *N. biflora* is an important component. Its trees are said to be ±200 yr. old, 83 ft. tall, 14.5 in. in diameter at 10 ft., and with a basal area, at this level, of 338.5 sq. ft. The various features are detailed, and the paucity of species in the understory is attributed to the long hydro-period, the great amplitude in water level, and the dense shade obtaining in this deep swamp forest.

Additions to the flora of the Glacier Bay National Monument, Alaska, 1935–1936, W. S. COOPER. (Univ. Minn.). (*Bul. Torrey Bot. Club, 66 (1939), No. 7, pp. 453–456*).—To the previous total of 232 species,[1] 31 are here added.

The order of bloom of trees and shrubs at the Arnold Arboretum, D. WYMAN (*Arnold Arboretum Bul. Pop. Inform., 4. ser., 7 (1939), No. 11, pp. 53–64*).—An informational leaflet.

Early flower production among the pines, F. I. RIGHTER. (U. S. D. A.). (*Jour. Forestry, 37 (1939), No. 12, pp. 935–938, figs. 2*).—Though it has been assumed that most pine species produce fertile cones only after a tree has attained considerable size, the data presented from Placerville, Calif., indicate that many pines do so at an average age of 6.2 yr. The breeding of special pine strains may thus not be a task requiring exceptionally long periods of time.

The physiology of growth and movement, E. BÜNNING (*Die Physiologie des Wachstums und der Bewegungen. Lehrbuch der Pflanzenphysiologie, II. Berlin: Julius Springer, 1939, pp. VI+267, figs. 233*).—This textbook of plant physiology takes up the general physiology of changes in activity and growth and the physiology of the mechanisms of movement and of irritability. Under the last heading are considered the basic problems of irritability, the action of mechanical stimuli, irradiation effects, temperature influences, the action of elec-

[1] Bul. Torrey Bot. Club, 57 (1930), No. 5, pp. 327–338.

tricity, of gravity, and of chemical stimuli, growth fluctuations and movements, and some general problems. Literature references occur at the end of the various sections, and a general subject index is provided.

A physiological study of the winter wheat plant at different stages of its development, E. C. MILLER (*Kansas Sta. Tech. Bul. 47 (1939), pp. [1]+167, figs. 28*).—As a basis for this monographic study, Kanred and Harvest Queen wheat varieties were grown in alternate field rows during the 3 yr. 1932–33 to 1934–35, while in 1931–32 only Kanred was grown. Samples of the aerial parts of these plants were collected each year for analysis, beginning 4 weeks after seeding and then at biweekly intervals (weather permitting) until elongation started in spring, after which samples were taken weekly until maturity. The heads were removed, beginning at a period before they had emerged from the "boot," and when the grain began to form they were further subdivided into chaff and grain. The rate of growth during any period was expressed by the increase in grams in the dry weight of 100 plants, and the analyses of the various components were expressed on a percentage basis and on the amount present in grams in 100 plants. The dried material (method described) was analyzed for total, protein, and protein-free nitrogen for 4 yr., for total, insoluble, and water-soluble phosphorus and total potassium for the first 3 yr., and for total, reducing, and nonreducing sugars an for starches and hemicelluloses for all 4 yr. The climatic and soil factors were also recorded. A copious review of the literature (92 references) is given, and treatment of the findings in great detail occurs in the text as well as in the curves presented in 28 figures and in an appendix containing 28 tables. There were no striking differences in the amount or distribution of the various components determined between Kanred (a typical hard winter wheat) and Harvest Queen (a typical soft winter wheat) grown under the same conditions. It is emphasized that the data obtained are relevant only to the conditions under which the plants were grown.

Mechanically initiated bark growth in Celtis, C. H. MULLER. (U. S. D. A.). (*Amer. Midland Nat., 22 (1939), No. 2, pp. 436, 437*).—Observations on warty growths on the bark of *C. mississippiensis* along the spirals left by the vine *Menispermum canadense* and around the holes left by certain woodpeckers led to the conclusion that they are initiated by mechanical irritation. The growth of these tumors consists simply of the activity of secondary meristems (cork cambiums) over a small area in the phloem. The mechanical injury serving to initiate the growth in this species is itself quite local and thus results in local bark formation.

Composition of the cell sap in the higher plants and its ecological significance [trans. title], M. STEINER (In *Ergebnisse der Biologie. Berlin: Julius Springer, 1939, vol. 17, pp. 151–254, figs. 26*).—A monographic review, with nearly eight pages of references.

Mechanical stimulation and respiration in the green leaf.—II, Investigations on a number of angiospermic species, L. J. AUDUS (*New Phytol., 38 (1939), No. 3, pp. 284–288, figs. 2*).—Continuing this line of investigation (E. S. R., 75, p. 28), the results with several angiospermic plants here described suggest that the respiratory response induced by rubbing and bending the leaf lamina is a widespread phenomenon in this large plant group. The bearing of this cellular sensitivity on experimental technic is obvious, and it would be instructive to know what part it has played in the results of past studies of respiration, where considerable handling of material was an integral part of the methods used.

Oxygen relations in hydrophytes, W. A. CANNON (*Science, 91 (1940), No. 2350, pp. 43, 44*).—From a consideration of the root systems (origin, anatomy,

and oxygen relations) in various hydrophytes, particularly *Carex limosa*, it is concluded that the slender, much branched main roots, shallowly placed and without prominent intercellular spaces, derive their required oxygen from the well-aerated air immediately around them, whereas the thicker main roots, provided with aerenchyma, develop and live under limited external oxygen supply, being able to secure the necessary amount from the rhizome and/or chlorophyll-bearing shoot.

Cortical air spaces in the roots of Zea mays L., D. C. McPherson (*New Phytol., 38 (1939), No. 3, pp. 190-202, pls. 2*).—Corn roots under natural conditions were found to produce large air spaces in their cortex, being more irregular than those in *Sagittaria* roots but formed in the same way. Production of these air spaces is preceded by deterioration and death of the protoplasm in groups of cells, during which process the cells lost their turgidity and their walls became crumpled and finally collapsed. Death of these cells was shown to be due to scarcity of oxygen, and a possible explanation for the action of this oxygen scarcity is suggested. Tests with other species showed different grades of susceptibility to oxygen deficiency and consequent differences in facility for producing air spaces. In no case were air spaces formed when the pectic acid in the cell wall had been changed to calcium pectate.

Contribution to the study of differentiation in the phellogen of scar tissue [trans. title], C. R. Marques de Almeida (*Agron. Lusitana, 1 (1939), No. 2, pp. 109-166, figs. 19; Eng. abs., pp. 150-153*).—Using potato tubers, an attempt was made to determine the stimulus inducing differentiation of the phellogen in scar tissue. A review of the literature (nearly three pages of references) is included, and the different theories are discussed. The experimental results led to the belief that the stimulus is hormonal in nature and that the liberation of the hormone from the wound is in some way related to the presence of oxygen.

On the factors affecting the mean seed weight of tomato fruits, L. C. Luckwill (*New Phytol., 38 (1939), No. 3, pp. 181-189*).—Variations were found in the mean weight of seed collected from different fruits of the same tomato genotype, and these were accomplished by corresponding variations in the mean dry weight of the embryo. The position of the truss on the plant had no effect on the mean weight of the seed. It was established by the method of correlation and regression that these variations in seed and embryo are attributable to variation in external environment, in number of fruits developing on the truss, and in number of seeds developing in the fruit. The maximum amount of variation attributable to each of these three factors is estimated from the partial regression coefficients.

Further studies on transport in the cotton plant.—VII, Simultaneous changes in the production and distribution of dry matter under varying potassium supply, E. Phillis and T. G. Mason (*Ann. Bot. [London], n. ser., 3 (1939), No. 12, pp. 889-899, figs. 5*).—In continuation of this work (E. S. R., 75, p. 459; 76, p. 767), it was found that the dry weight and its distribution (rest of plant/leaf blade) are closely correlated under varying potassium supply, this correlation holding under conditions of both high and low application. No such correlation was noted for nitrogen, while the results with phosphorus were inconclusive. This correlation is interpreted as being due to a quantitative relation under varying K supply between the rate of photosynthesis and that at which materials are exported from the assimilating cells to the phloem of the leaf. It is suggested that K controls the photosynthetic rate by altering the rate at which CO_2 diffuses to the chloroplasts, and that it controls equally the rate of sugar export from the chloroplast to the phloem of the leaf by altering the rate at which sugar diffuses through the protoplasm of the parenchyma.

Studies of the sulphur metabolism of plants, II, III, B. S. BARRIEN and J. G. WOOD (*New Phytol., 38 (1939), No. 3, pp. 257–264, figs. 3; pp. 265–272, figs. 3*).—The following installments of this series (E. S. R., 82, p. 159) are included:

II. *The effect of nitrogen supply on the amounts of protein sulphur, sulphate sulphur, and on the value of the ratio of protein nitrogen to protein sulphur in leaves at different stages during the life cycle of the plant.*—Using a grass species (*Andropogon sudanensis*) receiving three different initial supplies of nitrogen, the initial supply of sulfate remaining the same, an increased N supply caused an increase in the amount of protein S. As in the case of protein N, the highest N treatment caused at first a depression in the amount of protein S due to an effect on the growth rate. The absolute content of protein S rose to a maximum, and thereafter decreased, the position of this maximum being coincident with the maxima for amounts of dry matter and of water but not with the maximum for protein N, which was attained earlier. On a relative basis, after an initial rise, the amount of protein S decreased throughout the life cycle, although the rate of decrease was less rapid than that for protein N. The latter effect was seen in the value of the ratio of protein N to protein S, this ratio decreasing in amount throughout the life cycle, and at any harvest being higher the higher the N treatment. It is suggested that with increased N, protein S increases in amount but at the same time is diluted with a protein containing relatively less S, and also that the latter protein is utilized more readily within the plant than is the S-rich protein. Various factors contributing to the decrease in protein S are discussed.

III. *On changes in amounts of protein sulphur and sulphate sulphur during starvation.*—Using two grasses (*Lolium multiflorum* and *L. subulatum*) subjected to starvation in darkness at 16° C. and harvested at intervals over a 5-day period, analyses indicated that the protein S decreased in the leaves accompanied by a corresponding increase in sulfate S. No ethereal sulfate could be detected, and the amount of soluble organic S did not appreciably alter. In the leaves protein N decreased, but was not accompanied by an increase in soluble N compounds. In stems plus roots the amounts of protein S, protein N, and sulfate S did not change appreciably during the experiment, but the soluble N compounds increased owing to translocation from the leaves. The value of the ratio of protein N to protein S did not alter appreciably either in leaves or in stems plus roots. It is concluded that during protein katabolism in the leaves protein S is oxidized, probably by way of cystine, to inorganic sulfate S.

The significance of trace elements in the nutrition, growth, and metabolism of plants, II [trans. title], K. PIRSCHLE (In *Ergebnisse der Biologie. Berlin: Julius Springer, 1939, vol. 17, pp. 255–413*).—A continuation of the review previously noted (E. S. R., 80, p. 459), with 66 pages of references.

Vitamins and related substances in yeast, M. A. JOSLYN. (Univ. Calif.). *Mod. Brewer, 23 (1940), No. 1, pp. 38–40, 69–73*).—A rather detailed review of recent work, with tabulations and references.

The demonstration of small quantities of growth substances [trans. title], H. FUNKE (*Jahrb. Wiss. Bot., 88 (1939), No. 3, pp. 373–388, figs. 10*).—A technic is presented for determining minute amounts of growth substances, making use of excised oat coleoptiles. The high sensitivity of the method described is believed to depend on the very limited auxin content of the excised coleoptile and on the prolonged duration of the test.

Vitamins and growth factors in micro-organisms, with special reference to vitamin B_1 [trans. title], W. H. SCHOPFER (In *Ergebnisse der Biologie. Berlin:*

Julius Springer, 1939, vol. 16, pp. 1–172, figs. 58).—The subject matter of this monographic review (about 19 pages of references) is discussed under the following headings: Demonstration and properties of growth factors; action of different active substances on *Aspergillus niger*; vitamin B_1 (aneurin, thiamin) as a growth factor for various groups of bacteria, fungi, and protozoa; the roles of aneurin, pyrimidin, and thiazole as growth factors; general discussion of the action of aneurin; the bios substances; lactoflavin and vitamin B_6; ascorbic acid; carotin and vitamin A; the X factor—hematin; the V factor—codehydrase; nicotinic acid; the amino acids as growth factors for bacteria; uricil; pimelic acid; cholesterol; animal hormones and hormones of the auxin group as growth factors for micro-organisms; general summary of the chemically known active substances of the nature of vitamins; properties and definition of growth factors; symbiosis—parasitism and growth factors; and the cycle of growth factors.

A second factor involved in inhibition by auxin in shoots, R. SNOW (*New Phytol., 38 (1939), No. 3, pp. 210–223, figs. 7*).—By tests on cuttings of pea shoots compared with rooted plants it is shown that auxin paste inhibits much less strongly, if at all, when applied near the basal end of a length of stem, but if a mature leaf or a pair of cotyledons is present below the zone of application the paste inhibits with full strength. These results largely explain how it is that the paste fails to inhibit (or at most scarcely at all) when applied to the base of a downward-pointing strip. The reversal of the transpiration stream may also contribute to this result in some lesser degree. It is thus concluded that to induce inhibition the auxin coming from the paste needs to react or cooperate with some second factor supplied to the stem by leaves and cotyledons, and possibly by other members also. The results therefore tend to support the "indirect" explanation of inhibition, according to which the inhibiting influence originates indirectly from some reaction promoted by the auxin in the main stem. Reasons are given for concluding that upward inhibition of the main shoot by auxin paste is the same process as inhibition of lateral buds by auxin paste applied to the main stem, and the same also as natural correlative inhibition. Consequently the conclusions from experiments with auxin paste may be applied to correlative inhibition. Further points are discussed, including a theory of inhibition proposed by Van Overbeek (E. S. R., 80, p. 320).

Effect of phytohormones on Euglena in relation to light, A. M. ELLIOTT (*Amer. Micros. Soc. Trans., 58 (1939), No. 4, pp. 385–390, figs. 3*).—"The phytohormones, γ-3-*n*-indolebutyric acid, 3-indoleacetic acid, and α-naphthaleneacetic acid, were investigated for their stimulating effect on the growth of *E. gracilis* both in light and darkness. It was found that stimulation of growth occurred only in the presence of light; little or no effect was observed in darkness. The results of the investigation indicate a relationship between the presence of chlorophyll and phytohormone stimulation of growth in *Euglena*."

Cytological effects of treating maize pollen with ultra-violet light, W. R. SINGLETON and F. J. CLARK. (Conn. [New Haven] Expt. Sta.). (*Genetics, 25 (1940), No. 1, p. 136*).—An abstract.

The physiological changes produced in yeast by ultra-violet light and by heat, T. F. ANDERSON and B. M. DUGGAR. (Univ. Wis.). (*Science, 90 (1939), No. 2337, p. 358*).—A preliminary report on work with a single-cell strain of *Saccharomyces cerevisiae*. Of the physiological functions studied, the ability of the cells to divide proved to be the most sensitive to both agents. The results gave indications as to the mechanisms of the physiological processes studied and showed that some of them are relatively independent of each other, as, e. g., the ability of the cells to form colonies and their rate of respiration.

Further studies of the effects of temperature and other environmental factors upon the photoperiodic responses of plants, R. H. ROBERTS and B. E.

[St]ruckmeyer. (Wis. Expt. Sta. and Univ.). (*Jour. Agr. Res.* [U. S.], 59 (1939), [No.] 9, pp. 699–709, figs. 11).—Continuing these studies (E. S. R., 79, p. 312), [u]nder long- and short-day greenhouse environments maintained at minimum [te]mperatures of 55°, 65°, and 75° F., most of the plants tested gave very [u]nlike responses to photoperiod at the different temperatures. For example, [M]aryland Mammoth tobacco, a short-day plant at intermediate temperature, [fl]owered under both day lengths in a cool environment but remained vegetative [w]hen warm. The reactions of 39 species and some additional varieties and [cl]ones are also reported. Corn usually shows photoperiodic responses, but [n]ormal plants were obtained under both short and long days when the green[h]ouse was kept sufficiently warm at night. Plants grown from cuttings ex[h]ibited photoperiodic reactions unlike those of seedlings. The variability of a [p]lant population, grown either from seedlings or clones, depended largely on [th]e environments in which the plants had been grown. The effect of seed size [o]n plant vigor was influenced by the environal conditions under which the [p]lants had been grown. An environal shift during growth of many plants (e. g., [a]lfalfa) appeared to aid in securing the most desirable type of development.

Photosynthesis with radio-carbon, S. Ruben, M. D. Kamen, W. Z. Hassid [a]nd D. C. DeVault. (Univ. Calif.). (*Science*, 90 (1939), No. 2346, pp. 570, [5]71).—This is a preliminary report summarizing briefly the results obtained with [a] unicellular green alga (*Chlorella pyrenoidosa*) and radioactive carbon diox[id]e ($\dot{C}O_2$). In some respects the CO_2 reduction is similar to that found in [ba]rley and sunflower plants previously reported (E. S. R., 82, p. 437).

GENETICS

Symposium on the cell theory, II (*Amer. Nat.*, 74 (1940), No. 750, pp. [5–]53).—The following papers are included: A Modern Concept of the Cell as a [St]ructural Unit, by G. A. Baitsell (pp. 5–24); The Present Status of Mitosis, by [F]. Schrader (pp. 25–33); The Problem of Cell Individuality in Development, by [P]. Weiss (pp. 34–46); and What of the Future? by C. E. McClung (pp. 47–53). [T]hese four papers conclude the symposium previously noted (E. S. R., 82, p. 317).

Recent progress in plant breeding, E. B. Babcock. (Univ. Calif.). (*Sci. Mo.*, 49 (1939), No. 5, pp. 393–400).—Recent progress is reviewed and analyzed [w]ith the objective of indicating promising lines for future research.

The significance of polyploidy in plant evolution, G. L. Stebbins, Jr. [(U]niv. Calif.). (*Amer. Nat.*, 74 (1940), No. 750, pp. 54–66).—This is a critical [re]view of the subject, with the conclusion that "the evidence from the plant [ki]ngdom as a whole, therefore, suggests that polyploidy has been most impor[ta]nt in developing large, complex, and widespread genera, but that in respect [to] the major lines of evolution it has been more important in preserving relics [of] old genera and families than in producing new ones." There are 24 litera[tu]re references.

Colchicine induced tetraploidy in perennial ryegrass, Lolium perenne L., [W]. M. Myers. (U. S. D. A.). (*Jour. Hered.*, 30 (1939), No. 11, pp. 499–504, [fig]s. 2).—Seeds of *L. perenne* were germinated for 6, 24, and 96 hr. in petri dishes [o]n blotting paper moistened with 0.1, 0.2, and 0.4 percent aqueous solutions [of] colchicine. The 24-hr. treatments with 0.2- and 0.4-percent solutions of [co]lchicine were the most satisfactory from the standpoint of seedling survival [an]d incidence of induced tetraploidy, resulting in 12 out of 29 plants and 11 [ou]t of 28 plants, respectively, with 4n tissue. Some plants obtained were com[pl]etely tetraploid, whereas in others sectors of 2n and 4n tissue occurred. Ab[no]rmalities of the seedlings and of the mature plants usually accompanying [ch]romosome doubling were not reliable criteria of tetraploidy, since many

abnormal seedlings and plants did not have $4n$ roots or flowers. Plants producing tetraploid root tips also produced giant pollen grains, indicating that $4n$ reproductive tissue had been produced. Tetraploid progenies were obtained from seed produced on plants having $4n$ root tips and giant pollen grains. Hypodermic injection of colchicine solution into tillers of young plants was effective in producing a $4n$ sector in one case.

Induction of simple and multiple polyploidy in Nicotiana by colchicine treatment, H. E. WARMKE and A. F. BLAKESLEE (*Jour. Hered., 30 (1939), No. 10, pp. 418–432, figs. 11*).—Chromosome numbers were doubled through colchicine treatment in *N. sanderae* ($n=9$) and in the sterile species hybrids *N. tabacum* ($n=24$) × *N. glutinosa* ($n=12$) and *N. glutinosa* ($n=12$) × *N. sylvestris* ($n=12$). Seed treatment gave as high as 100 percent tetraploids in *N. sanderae* and as high as 46 percent plants with doubled chromosome number in *N. tabacum* × *N. glutinosa*. An emulsion spray containing colchicine (for which a formula is given) was more effective than a water solution in treating shoots. "The term double haploid, $2(1n)$, is suggested to describe a species hybrid which is sterile on account of chromosome incompatibility. Doubling the chromosome number of a double haploid would produce a double diploid, $2(2n)$. A second doubling would produce a double tetraploid, $2(4n)$."

Knob positions on corn chromosomes, A. E. LONGLEY. (U. S. D. A.). (*Jour. Agr. Res.* [U. S.], *59 (1939), No. 7, pp. 475–490, figs. 4*).—Study of the midprophase of the first meiotic division of pollen mother cells from 74 varieties of corn of the United States and Mexico showed that knobs are at points on the thread at an appreciable distance from the fiber attachment and not distributed uniformly over the whole length of the chromosome, and that knob frequency is a function of the distance of a knob-forming point from the fiber attachment. A relationship between frequency of knobs and the distance of knob-forming points from the fiber attachment, also noted in strains of annual teosinte, was interpreted to mean that each chromosome arm possesses a gradient.

Gene symbols for use in cotton genetics, J. B. HUTCHINSON and R. A. SILOW (*Jour. Hered., 30 (1939), No. 10, pp. 461–464*).—The cotton genes of which descriptions are known are listed, and attempt is made to adjust the nomenclature in accordance with accepted genetic conventions and with regard to the special circumstances obtaining in *Gossypium*.

The relationships of Gossypium raimondii Ulb., J. B. HUTCHINSON (*Trop. Agr.* [*Trinidad*], *16 (1939), No. 12, pp. 271, 272*).—In spite of failure of crossing between them, *G. raimondii* is grouped with *G. klotzschianum* and *G. davidsonii* on account of morphological similarity, and these species are regarded as rather widely separated from the other New World cottons with $n=13$ chromosomes.

Studies on ascospore variants of Hypomyces ipomoeae, A. W. DIMOCK. (Univ. Calif.). (*Mycologia, 31 (1939), No. 6, pp. 709–727, figs. 6*).—A number of variants not well explainable by Mendelian segregation of pre-existing genes are reported to have arisen as the primary growth from single ascospores isolated from both inbred and hybrid perithecia of *H. ipomoeae*. Hybridization studies indicated these variations (one possible exception) to have resulted from gene mutation. Reversion of many of these mutants to the "normal" type, in both maturation divisions and vegetative cells, showed that the mutations were of the nature of inactivation or alteration rather than deletion of genes. The observations are believed to suggest strongly that gene mutation is favored in the maturation divisions—particularly in heterozygotes. The effects of the mutations appeared in some cases to be carried over into the gameto-

phytic cells of the mutants. Evidence is presented to indicate that under existing environal conditions the ascospore variants studied would not be perpetuated in competition with the normal type.

A developmental analysis of heterosis in Lycopersicon.—II, The role of the apical meristem in heterosis, W. G. Whaley (*Amer. Jour. Bot., 26 (1939), No. 9, pp. 682–690, figs. 15*).—In a study of developmental changes in the volume, cell size, and nuclear size in the apical meristems of two *Lycopersicum* species showing heterosis, no relation was found, either in the embryo or during development, between the volume of the apical meristem and heterosis. Size of the meristem is related to the size of the determinate organs developed from it. Cell and nuclear size in the meristem was found to decrease during development, but much less rapidly in the hybrids than in the pure species. The attainment of a minimal cell and nuclear size is associated with the onset of maturity. The earlier paper was noted (E. S. R., 82, p. 319).

Formulas for determining theoretical effects of certain genetic factors upon inheritance of quantitative characters, with special reference to a study of a Lycopersicon hybrid, LeR. Powers. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 59 (1939), No. 8, pp. 555–577, figs. 2*).—Formulas are presented for determining the theoretical effect of double crossing over and dominance upon the differences between the means of the genotypes involved in inheritance of quantitative characters. With the aid of these formulas and by means of the three-point method of analysis, it is possible to determine the individual effect of regions of the chromosome upon the quantitative character under investigation. In data obtained from progeny resulting from backcrossing the F_1 generation to the parent recessive for the marker genes, neither the effects due to double crossing over nor the effects due to dominance are confounded with possible interactions.

The data presented were obtained from a cross between *Lycopersicum esculentum* var. Johannisfeuer and *L. pimpinellifolium* var. Red Currant. The nature of the interactions was such that the effect of the genes tending to increase the number of locules per fruit was found geometrically cumulative for "between means" of genotypes and for between means of generations for the different genotypes.

A genetic analysis of red seed-coat color in Phaseolus vulgaris, F. L. Smith (*Hilgardia [California Sta.], 12 (1939), No. 9, pp. 551–621, pls. 2*).—With the ultimate objective of stabilizing the red color of the Red Kidney bean, a genetic study was made of the factors underlying color formation in beans. The crosses involved varieties of red beans, mottled beans that are predominantly red, white beans, and progeny of these crosses. Ridgeway's Color Standards and Color Nomenclature (E. S. R., 29, p. 762) was used. In hybrids between red-seeded varieties there were encountered six genes which affected seed-coat color or its distribution. *P* is the primary pigmentation factor necessary for any color to develop. Beans with *P* but without any complementary pigmentation color genes were white. Beans homozygous for *p* are white, regardless of what other color genes they may possess. *M* is a mottling gene found in a number of red-mottled varieties. Its recessive *m* is self-colored. *Rk*, a gene for buff color, is the dominant allel of *rk* responsible for the testaceous color typical of the Red Kidney variety. *MRk* beans are mottled on buff background, and *Mrk* are mottled on a testaceous background. *R* is the gene for deep red. Beans heterozygous for *R* are mottled, those with *RrRk* are mottled on buff, and those with *Rrrk* are mottled on testaceous. *Bl* is a color modifier which changes oxblood red to purple and changes red-mottled beans to purple-mottled when the mottling is caused by either hetero-

zygous *R* or *M*. *E* is the dominant allel of *e*, a gene for eye pattern, and *E* beans are self-colored. No linkage was observed between *RkMBl*, *RkRBl*, or *RkE*. Some data indicated complete linkage of *M* and *R*. No cross-over classes were found. None of the six genes was suitable as a modifier of Red Kidney, but certain F_2 segregates from crosses involving Mexican Red approached the ideal type.

Chromosome number in some tulip hybrids, R. BAMFORD, G. B. REYNARD, and J. M. BELLOWS, JR. (Md. Expt. Sta.). (*Bot. Gaz. 101 (1939), No. 2, pp. 482–490*).—Chromosome counts in the root-tip cells of seedlings obtained from reciprocal crosses involving both triploid and pentaploid forms of *Tulipa* showed the majority to be aneuploids. The triploid, either as male or female parent, tends to contribute less than one-half the number of somatic chromosomes. This fact is thought to be due to the irregularities in the meiotic divisions of this type. A similar condition exists in the progeny of crosses involving pentaploid forms.

A descriptive list of natural and artificial interspecific hybrids in North American forest-tree genera, L. P. V. JOHNSON (*Canad. Jour. Res., 17 (1939), No. 12, Sect. C, pp. 411–444*).—Over 400 hybrids involving 28 North American genera of forest trees are described in tabular form with the object, primarily, of providing useful information for the forest-tree breeder. The genera involved are *Abies*, *Acer*, *Aesculus*, *Alnus*, *Arbutus*, *Betula*, *Carya* (=*Hicoria*) *Castanea*, *Catalpa*, *Cornus*, *Crataegus*, *Cupressus*, *Gleditsia*, *Ilex*, *Juglans*, *Larix*, *Magnolia*, *Picea*, *Pinus*, *Platanus*, *Populus*, *Quercus*, *Robinia*, *Salix*, *Taxus*, *Tilia*, *Tsuga*, and *Ulmus*.

[Papers on animal genetics presented before the Genetics Society of America at the 1939 meetings in Columbus, Ohio] (*Genetics, 25 (1940), No. 1, pp. 110, 114, 115, 116, 118, 119, 120, 121, 122, 123, 127, 129, 130, 131, 139, 140, 141; also in Genet. Soc. Amer. Rec., 8 (1939), pp. 110, 114, 115, 116, 118, 119, 120, 121, 122, 123, 127, 129, 130, 131, 139, 140, 141*).—Brief abstracts are presented on the following articles: Absence of Linkage Between Certain Characters in the Deer-Mouse, *Peromyscus maniculatus*, by E. Barto; Immunological and Geographic Relationships Among Pigeon Species, by R. W. Cumley and M. R. Irwin (Univ. Wis.); An Independent Recurrence of the Blue Mutation in *Rattus norvegicus* and Observations on a Mosaic of Blue and Its Normal Allelomorph, by M. R. Curtis and W. F. Dunning; Preliminary Report on Variation in Ability of Dogs To Master a Multiple-Choice Situation, by W. M. Dawson and R. Katz (U. S. D. A.); Changes of Dominance in the House Mouse, by L. C. Dunn; Gene Frequencies and Parallel Variations in Natural Populations of Seven Geographical Species of Mexican Fresh-Water Fishes, by M. Gordon; The Structural Significance of Reproduction Capacity in Self-Reproducing Entities, by J. W. Gowen (Iowa State Col.); Bifurcated Xiphoid, Another Effect of the Short Ear Gene in the Mouse, by E. L. Green and C. W. McNutt; Tests for Linkage in *Peromyscus*, by R. R. Huestis; A Map for Six Linkage Groups in the Fowl, by F. B. Hutt and W. F. Lamoreux, and A New Linkage Group in the Fowl, by F. B. Hutt (both Cornell Univ.); Interrelationships of the Cellular Characters of Three Species of *Columbidae*, by M. R. Irwin and L. J. Cole, and Interrelationships of the Cellular Characters of Species of *Columba*, by M. R. Irwin and R. W. Cumley (both Univ. Wis.); Hereditary Variations in the Vena Cava Posterior of the Rabbit, by C. W. McNutt, T. E. Tetreault, and P. B. Sawin; Chromosome Aberrations and Viability in *Apotettix eurycephalus* Hancock, by R. K. Nabours and F. M. Stebbins (Kans. Expt. Sta.); The Role of Constitution in the Emotionality of the Adult Albino Rat, by M. M. Parker (Ohio State Univ.); Studies in Viability

of Poultry—I, Inherent Resistance to Fowl Paralysis, by N. F. Waters and C. A. Brandly (U. S. D. A.); and On the Origin of Epidemic Virulence, by M. R. Zelle and J. W. Gowen (Iowa State Col.).

[The production of no-tail sheep by the South Dakota Station], J. W. Wilson (*South Dakota Sta. Rpt. 1939, p. 22*).—Of 91 lambs born in 1939, 35 had no tails, 24 had tails of 1 in. or less, 17 had tails between 1 and 2 in., 5 between 2 and 3 in., and 6 between 3 and 4 in. Only 4 had tails over 4 in. in length.

A quantitative study of the genic effects on guinea-pig coat colors, E. S. Russell (*Genetics, 24 (1939), No. 3, pp. 332–355, figs. 6*).—Quantitative methods are suggested for comparing the pigments in guinea pig hairs. Tests were made of colorimetric comparisons of alkaline solutions of yellow pigment from all available genotypes. The percentage of the total weight of the hair made up of melanin was determined by Einsele's method (E. S. R., 77, p. 318), and tests were made of the melanin content of hairs from sepias, pale sepias, and (to a certain extent) yellows. The homozygotes of the lower active allels of the genes C, c^k, c^d, c^r, and c^a produced about twice as much pigment as their allels, but the highest allel seemed to be completely dominant. The lower allels in the C series reduce the amount of pigment much more drastically in yellows and pale sepias than in dark sepias. Measurements and suggestions as to the nature of the action of F, P, and B series and their allels are also noted.

[Papers on poultry genetics] (*Poultry Sci., 18 (1939), No. 5, pp. 399, 400, 401, 402, 403, 404, 405 406, 407, 409, 411, 414*).—Brief abstracts are presented on the following papers, not essentially noted elsewhere, which were given before the annual meeting of the Poultry Science Association in 1939: Some Factors Affecting Hatchability of Eggs, by V. S. Asmundson (Univ. Calif.); The Results of Eight Years' Selection for Disease Resistance and Susceptibility in White Leghorns, by G. E. Bearse, C. F. McClary, and M. W. Miller (West. Wash. Expt. Sta. et al.); Studies on the Relationship of Adult Mortality in S. C. White Leghorns to Production, Sexual Maturity, Body Weight, and Other Factors, by C. H. Bostian and R. S. Dearstyne (Univ. N. C.); Body Measurements and Market Grades of Turkeys, by J. H. Bywaters, W. M. Insko, Jr., and J. H. Martin (Ky. Sta.); A New Autosomal Lethal in the Fowl, by R. K. Cole (Cornell Univ.); Color Markings in Rhode Island Red Chicks, by F. A. Hays (Mass. State Col.); Evidence of Subnormal Reproduction in Wyandottes, by F. B. Hutt and J. H. Bruckner, and Auto-Sexing With Genes for Barring and Mottling, by W. F. Lamoreux (both Cornell Univ.); The Effect of Anterior Pituitary Extract on the Fat and Vitamin A Metabolism in the Chick, by W. A. Maw, W. D. MacFarlane, W. E. Parker, J. A. Stuart, and J. B. Collip; Observations on the Sexual Behavior of Cockerels, by J. E. Parker, F. F. McKenzie, and H. L. Kempster (Univ. Mo.); Sex Identification of Jersey Black Giant, Jersey White Giant, and White Plymouth Rock Chicks by Down, Shank, and Beak Color, by J. P. Quinn and C. W. Knox (U. S. D. A.); The Nature and Persistency of the Order of Dominance in the Domestic Fowl and Its Relation to Managerial Practices, by W. C. Sanctuary (Mass. State Col.); and Seasonal Rhythms in the Fowl, by C. F. Winchester (Univ. Mo.).

A study of feather character in limbs transplanted between embryos of different bird species, H. L. Eastlick. (Univ. Mo.). (*Natl. Acad. Sci. Proc., 25 (1939), No. 11, pp. 551–557, figs. 2*).—In this study of transplantation of portions of the limb buds of guinea fowls, ducks, turkeys, chickens, partridges, and quail to several breeds of chickens it was found that the character of the donor persisted in most of the transplants, but in some cases the melanophores from the host invaded the graft. Certain irregularities were noted in

guinea grafts on chicks. The position on the body on which the grafts were made frequently determined the results obtained.

The reproductive system of the male opossum, Didelphis virginiana Kerr, and its experimental modification, E. B. CHASE (*Jour. Morphol., 65 (1939), No. 2, pp. 215–239, pl. 1, fig. 1*).—Study was reported of the ♂ reproductive system and associated organs of 43 opossums. Three glands around the urethra, posterior to the bladder, are designated as prostate glands. Three well-developed lobes of Cowper's glands were also present in the opossum. Castration decreased the size of the gland tubules, especially the size of the third lobe. Injections of Antuitrin-S and prospermin did not have effect unless the doses were very large, when the urethra and Cowper's glands increased in weight.

Atresia and the interstitial cells of the ovary, B. F. KINGSBURY. (Cornell Univ.). (*Amer. Jour. Anat., 65 (1939), No. 2, pp. 309–331, pls. 3*).—This reports fundamental studies of the formation of interstitial cells and atretic follicles in the ovary of the cat made from an examination of 110 post-partum ovaries, including 1,068 follicles.

The comparative behavior of mammalian eggs in vivo and in vitro.—IV, The development of fertilized and artificially activated rabbit eggs, G. PINCUS (*Jour. Expt. Zool., 82 (1939), No. 1, pp. 85–129, pls. 8*).—In continuation of this series (E. S. R., 79, p. 182), cytological studies of the development of rabbit ova normally ovulated, superovulated and fertilized with rabbit sperm, or activated by other solutions showed that the development was comparable in vivo and in vitro. Degeneration began soon after 17 hr. in the unfertilized ova, and no signs of activation were exhibited. Unfertilized ova in vitro were activated by exposure of the ova to hypertonic solution or supranormal temperature, culturing in a moist chamber, or treatment with rabbit sperm, and to a limited extent with rat sperm. The sperm of other species caused activation of the ova, but they did not enter the eggs. Ovarian and tubal ova taken from three ♀♀ and artificially activated in vitro developed into living young when transplanted to the Fallopian tubes of pseudopregnant rabbits.

The breeding of some rabbits produced by recipients of artificially activated ova, G. PINCUS (*Natl. Acad. Sci. Proc., 25 (1939), No. 11, pp. 557–559*).—An account was noted above of the production of 3 litters of rabbits from ova artificially activated by heat or salt solution and allowed to develop in the uteri of does made pseudopregnant by mating with a vasectomized ♂ or with pituitary extract. The parthenogenetic agouti ♂ produced was mated with 4 color types of ♀♀. There were produced 58 offspring which showed that the genotype of the ♂ was AaC^{ch}. There were 36 ♀♀ and 22 ♂♂. The 2 parthenogenetic nonagouti ♀♀ surviving to breeding age produced 48 young. The color of these young proved 1 dam to be definitely chinchilla and 1 nonchinchilla. In another case, 2 chinchilla ♀♀ were born to an albino rabbit made pseudopregnant with pituitary extract, receiving 18 ova from the doe of the genotype $AAc^{ch}c$, and artificially treated. One of the young ♀♀ produced was mated to an albino ♂ and produced 6 chinchilla and 3 albino young. The other ♀ proved sterile.

The first meiosis in the rabbit is not necessarily reductional. Evidently, viable parthenogenetic rabbits can be obtained from artificially activated eggs, and fertile progeny can be produced.

A testis stimulating extract of brewer's yeast, R. O. GREEP, F. L. HISAW, and H. L. FEVOLD (*Anat. Rec., 73 (1939), No. 3, pp. 297–305, pl. 1*).—An account is given of experiments in which an acetone extract of dry yeast was prepared

which stimulated testicular growth in immature rats and pigeons and supported gametogenesis in mature ♂♂ for at least 16 days following hypophysectomy. The secondary sex organs did not respond when treated with the extract.

The differentiation of sex in the opossum (Didelphys virginiana) and *its modification by the male hormone testosterone* propionate, R. K. BURNS, JR. (*Jour. Morphol., 65 (1939), No. 1, pp. 79–119, pls. 3, figs. 9*).—Changes in the development of the sexual organs in the ♂ and ♀ opossum as a result of the administration of testosterone propionate, beginning on the first or second day of pouch life, are described. The hormone was found to exert simultaneously in the same individual an androgenic and gynogenic effect.

Testicular function and the action of gonadotropic and male hormones in *hyperthyroid male rats*, G. K. SMELSER (*Anat. Rec., 73 (1939), No. 3, pp. 273–295*).—Injections of thyroxin and the feeding of thyroid glands to ♂ rats caused a decrease in testis weight, sperm production, and hormone secretion. Gonadotropic extracts maintained normal testicular function, but its continued action decreased in hyperthyroidized animals. In hyperthyroidism there was a decrease in the ability of the testis to respond to the pituitary hormone which caused testicular hypofunction.

***The effect of synthetic male hormone substance upon follicular growth* and ovulation in the guinea pig**, J. L. BOLING and J. B. HAMILTON (*Anat. Rec., 73 (1939), No. 1, pp. 1–15, pl. 1*).—The daily administration of 4 mg. of synthetic testosterone propionate to guinea pigs suppressed follicle growth and ovulation in 19 of the animals tested, and the vaginas failed to open. No corpora lutea were observed in the ovaries. The reproductive cycle and ovulation returned soon after the cessation of the androgenic injections and in a shorter time than was required in the normal animal after a period of heat.

Failure to antagonize the action of oestradiol on the corpus luteum by progesterone or testosterone, J. M. ROBSON (*Quart. Jour. Expt. Physiol. and Cog. Med. Sci., 29 (1939), No. 2, pp. 159–164, figs. 2*).—The daily administration of 1 mg. of oestradiol was found sufficient to maintain luteal function in a majority of hypophysectomized rabbits previously given an ovulating dose of human-pregnancy urine intravenously. The administration of testosterone propionate or progesterone with the oestradiol did not prevent the luteal action, nor would the administration of these hormones separately from oestradiol bring about luteinization. The action of oestradiol on the corpora lutea was concluded not to be antagonized by progesterone or testosterone.

The action of small quantities of progesterone, O. THOMSEN, K. PEDERSEN-BJERGAARD, and I. ANDERSON (*Endocrinology, 25 (1939), No. 6, pp. 944–952, figs. 5*).—In an attempt to evolve quantitative and more accurate tests for the presence of progesterone in the urine, a test was developed on rats which was based on the contraction or dilation of the uterus at different intervals following the subcutaneous administration of extremely small amounts of the hormone.

Repression and resorption of the corpora lutea of early pregnancy following injections of testosterone propionate, H. O. BURDICK and B. EMERSON (*Endocrinology, 25 (1939), No. 6, pp. 913–918, figs. 4*).—Daily injections into mice of 5 mg. of testosterone propionate beginning on the day of mating hastened the resorption of the corpora lutea and the decrease in the size of the copora lutea in the ovaries. Daily treatment with 0.25 mg. of the hormone caused the ovaries to enlarge but caused the corpora lutea to become small and degenerate, although their resorption was not as rapid as in the 5-mg. series.

The effect of large doses of testosterone propionate (Oreton) on the female genital tract of the very young rat—production of ovarian cysts,

H. Shay, J. Gershon-Cohen, K. E. Paschkis, and S. S. Fels (*Endocrinology, 25 (1939), No. 6, pp. 933–943, figs. 10*).—The subcutaneous administration to ♀ rats of doses of from 0.5 to 1 mg. of Oreton, beginning on the first or second day of life, showed considerable variation in the treated animals. In many of them the vaginas opened and ovarian tumors were produced which were, in the main, lutein cysts. In other cases the ovaries atrophied without luteinization. The oestrous cycle was not always completely suppressed. Mature follicles were found on one of the atrophic ovaries. It appeared that the action was principally a depression of the pituitary gland and its secretion of hormones.

The modification of sexual differentiation in genetic female mice by the prenatal administration of testosterone propionate, C. D. Turner (*Jour. Morphol., 65 (1939), No. 2, pp. 353–381, pls. 2*).—The administration of testosterone propionate to ♀ mice was found to induce varying degrees of intersexuality in the progeny of such mice as were at 10 to 14 days of gestation. Treatments at later stages had less effect. Subcutaneous administration was more effective than intraperitoneal. The administration of large amounts of testosterone propionate during intrauterine development impairs ovarian function in preventing ovulation, luteinization, and cyclic behavior. It resembles treatment from irradiation.

Modification of the social order in flocks of hens by the injection of testosterone propionate, W. C. Allee, N. E. Collias, and C. Z. Lutherman (*Physiol. Zool., 12 (1939), No. 4, pp. 412–440, fig. 1*).—Injections of testosterone propionate into ♀ White Leghorns seemed to stimulate comb and wattle growth, inhibition of egg laying, and dominance over other birds in the flock.

FIELD CROPS

[Crop research of the U. S. Department of Agriculture, 1939] (*U. S. Dept. Agr., Sec. Agr. Rpt., 1939, pp. 127–129, 130, 131, 145*).—Brief reviews and comments are made on the application of research findings in action programs, including cotton quality improvement through cooperation in standardized one-variety communities; conservation of effort in bindweed control by determination of shifts of food material in growth renewal after cultivation; experimental use of colchicine in improvement work and genetic research with cotton, flowers and other ornamentals, certain cereals, tobacco, fruits, grasses, and other crops; use of plant hormones in propagation of plants, in setting of the fruits of some plants without pollination, and in modifying or accelerating growth of certain plants; and the development and status of hybrid corn, a new industry based on research.

[Agronomic research in Illinois], W. L. Burlison, J. J. Pieper, O. H. Sears, J. C. Hackleman, C. M. Woodworth, L. F. Williams, K. J. Kadow, H. W. Anderson, L. E. Allison, W. P. Flint, J. H. Bigger, B. Koehler, G. H. Dungan, W. J. Mumm, J. R. Holbert, A. L. Lang, D. C. Wimer, O. T. Bonnett, H. H. McKinney, L. V. Sherwood, C. J. Badger, and P. E. Johnson. (Partly coop. U. S. D. A. et al.). (*Illinois Sta. Rpt. 1937, pp. 47–60, 64–67, 70, 71, 73–87, figs. 12*).—Field crops research reported on briefly (E. S. R., 78, p. 185) included variety trials with corn (and corn hybrids), winter and spring wheat, oats, barley, buckwheat, perilla, grain sorghum, alfalfa, red clover (strains), lespedeza, soybeans, and miscellaneous grasses and clovers and combinations of pasture and forage plants; breeding work with corn for oil and protein content and with wheat, oats, and soybeans; improvement of corn by inbreeding and by reconstitution; the inheritance of seed and leaf characters in soybeans and broomcorn; effects of hailstorms on soybeans; cultural (including planting) tests with soybeans, red clover, wheat, and barley; cutting tests with reed canary grass; fertility

value of cornstalk ash and residues; growing and handling soybeans; pasture studies; studies of factors influencing the nodulation of canning peas; comparison of types of legume inoculants; tests of chlorates and other chemicals for control of poison-ivy, Canada thistle, and quackgrass; studies of development and chemical control of bindweed; life history and control studies with wild garlic and onions; and production experiments with crops relatively new in the State, including perilla, pyrethrum, grain sorghum, buckwheat, broomcorn, and flax.

[Farm crops experiments in Mississippi] (*Miss. Farm Res.* [*Mississippi Sta.*], *2* (*1939*), *No. 12, pp. 1, 2, 3, 4, 5, 6, 7, 8*).—Experiments with field crops are briefly reported in articles entitled Rates, Analysis Tests for Cotton, Brown Loam Soil Show Crop Needs (pp. 1, 8) and Yields of Peanuts Show Response to Fertilization (p. 7), both by J. Pitner; Fertilizer Response Varies With Soils, Crops, Application, by J. L. Anthony (pp. 1, 2); Deer Creek Loam Soil Results of Nitrogenous Fertilizer for Corn, by R. Kuykendall (p. 2); Spacing in Row Markedly Affects Sweetpotato Grade, by W. S. Anderson (p. 2); Mississippi's Average Yield of Cotton Per Acre Doubled in 1937, Nearly Doubled Other Years (pp. 3, 4); Feed Sufficiency Difficult of Accomplishment While Corn Yields Only 15 Bushels Per Acre (p. 4); Oats, Cane, Potatoes, Pastures Have High Potentialities (p. 5); Farmers in Starch Area More Than Double Yield of Sweetpotatoes, Others Can Do Likewise (p. 5); Pastures, Legume Hay Crops Doubled in Yields in Regional Tests With Superphosphate (p. 5); Farm Value of Hay Substantially Increased by Research-Approved Method of Curing (p. 5); Better Crop Yields Follow Use of Fertilizer Made Neutral With Dolomite Limestone (p. 6); and Potential Profits From Good Pastures, Feed Crops, Emphasized by Dairy Investigations (p. 6).

[Field crops experiments in South Dakota], A. N. Hume, C. J. Franzke, L. F. Puhr, M. Fowlds, J. G. Hutton, J. W. Wilson, C. C. Lipp, S. P. Swenson, and I. B. Johnson. (Partly coop. U. S. D. A.). (*South Dakota Sta. Rpt. 1939, pp. 7–12, fig. 1*).—Agronomic investigations (E. S. R., 81, p. 201) reported on briefly included breeding work with corn and corn hybrids, hard red spring wheat, oats, alfalfa, and with sorghum for low hydrocyanic acid content; inheritance studies with sorghum and sweetclover; depth of plowing tests; and variety tests of alfalfa and forage grasses.

A grass leviathan from East Africa, I. B. Pole Evans (*Nature* [*London*], *144* (*1939*), *No. 3635, pp. 34, 35, fig. 1*).—A giant Star grass (*Cynodon plectostachyum*) combining attributes of a pasture, hay, and soil conserver has been under study at Rietondale Pasture Research Station, Pretoria. A single runner grew 48.5 ft. in 5.5 mo. after it left the parent plant.

The thermal death point of corn from low temperatures, G. P. McRostie (*Sci. Agr.*, *19* (*1939*), *No. 11, pp. 687–699, figs. 8*).—Ears of corn representative of four moisture groups, below 15, from 15 to 19.9, from 20 to 24.9, and 25 percent plus, were subjected to eight conditions of temperature, from −10° to 32° F., for varying periods at Ontario Agricultural College. The high moisture groups under all conditions of storage suffered severely in germinability. Fluctuating temperatures, particularly in the lower temperature groups, caused more damage than steady exposures to the lowest temperature in each treatment. No appreciable difference was noted between reactions of the dent and flint corn types to any treatment. For safe storage the moisture content of corn evidently should be well below 15 percent.

Cotton fertilizer practices in Tennessee, C. E. Allred and B. D. Raskopf (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 98* (*1939*), *pp. [2]+III+30, figs. 14*).—Information on the fertilizer practices of gin patrons and

other cotton growers in Crockett County, largely obtained in surveys and concerned with kinds, rates, and costs of fertilizers, top dressing, and extent of use, is summarized, with data on fertilizer used for cotton in Tennessee and agronomists' recommendations. Indications were that the farmers of the western two-thirds of West Tennessee might well use fertilizers with more emphasis upon nitrates and those of the eastern third of West Tennessee fertilizers of mixed requirements, or those with greater emphasis on phosphates.

Influence of boron on flower-bud development in cotton, K. T. HOLLEY and T. G. DULIN. (Ga. Expt. Sta.). (*Jour. Agr. Res.* [U. S.], *59* (1939), No. 7, pp. 541–545, figs. 2).—Boron was found necessary for flower-bud development in cotton, and more was needed than for fair vegetative growth. A boron level which was too low for flower-bud development had no apparent effect on flower-bud initiation.

Further studies and technic used in sweet potato breeding in Louisiana, J. C. MILLER. (La. State Univ.). (*Jour. Hered.*, *30* (1939), No. 11, pp. 484–492, figs. 3).—By overwintering sweetpotato vines in pots in the greenhouse, shifting them to the field in early spring, training to a wire trellis, and then girdling them, it has been possible to produce seed in satisfactory numbers by crosses and selfs from all standard varieties, such as Porto Rico, Nancy Hall, Triumph, and many others. Some varieties set seed best in the spring, others set seed best in the fall, and there were yet other varieties which bloomed and set seed throughout the entire growing season. It is suggested that there are optimum conditions under which most varieties will bloom and set seed freely. See also earlier notes (E. S. R., 79, p. 624; 81, p. 508). Pertinent literature is reviewed.

Winter wheat varieties for Illinois, G. H. DUNGAN, W. L. BURLISON, B. KOEHLER, and O. T. BONNETT (*Illinois Sta. Bul. 460* (1939), pp. 85–104, figs. 4).—Variety tests with winter wheat (E. S. R., 55, p. 337) made 1926–39 at the station at Urbana, DeKalb, and Alhambra in central, northern, and southern Illinois, respectively, are summarized, with criteria for the choice of a variety and recommendations for soil treatments and cultural methods and field practices for the crop. The merits and faults of varieties included in the tests are indicated in a table.

While the average acre-yield of winter wheat for the United States as a whole has been slightly downward over the last 44 yr., Illinois acre-yields have trended upward from a little over 11 bu. for the period 1895–98 to a little less than 17 bu. for 1935–38. Corresponding yields for the nation were 14.7 and 12.9 bu. Yields at the station in the rotation corn, oats, clover, and wheat over the last 35 yr., including Turkey during the entire period, showed that during the first 5 yr. the five best varieties yielded 4.4 bu. an acre less than Turkey but in the last 5-yr. period averaged 4.7 bu. an acre more.

Varietal leaders on the DeKalb field with comparable acre-yields were Kawvale 34 bu., Ioturk 32.4, Minturki 31.1, Purkof 30.4, Illinois 2 29.7, Hardy Northern 29.7, and Kanred 29.7 bu. Highest ranking winter wheats at Urbana were Kawvale 42.7 bu., Tenmarq 41.5, Brill 40.8, Wabash 40.7, and Duffy 40.1 bu. At Alhambra the top group in yields included Fulcaster 26.5 bu., Brill 24.8, Nabob 24.2, Red Sea 24.1, Purdue 1 23.9, Michigan Amber 23.7, and Wabash 23.7 bu.

Further studies on root characteristics of winter wheat in relation to winter injury, C. A. LAMB. (Ohio Expt. Sta.). (*Jour. Agr. Res.* [U. S.], *59* (1939), No. 9, pp. 667–681, fig. 1).—Data obtained from five series of wheat variety-root studies supplement those reported earlier (E. S. R., 75, p. 624). Late fall was found to be the best time to study field-grown material, be-

cause plants do not change so much over the experimental period and vascular stele measurements are then made more simply and accurately. Stele diameter was found a better measure of root size with which to associate breaking tension than diameter or cross-sectional area of the whole root. A wide range of fertility level did not alter appreciably the varietal ranking, although it markedly affected both size and strength of roots.

Results of seed tests for 1939, B. G. SANBORN (*New Hampshire Sta. Bul. 316 (1939), pp. [1]+36*).—Germination and purity percentages are tabulated for 426 official samples of field crop seed collected from dealers in New Hampshire during the year ended June 30, 1939.

Agricultural seed, A. S. LUTMAN (*Vermont Sta. Bul. 451 (1939), pp. 18*).—Purity and germination guaranties and variations therefrom are tabulated and discussed from tests of 621 samples of agricultural seed collected from dealers in Vermont during 1939.

HORTICULTURE

[Horticultural studies by the South Dakota Station], L. D. HINER, J. G. HUTTON, N. E. HANSEN, L. L. DAVIS, and S. A. MCCRORY (*South Dakota Sta. Rpt. 1939, pp. 12–15, 42–45, figs. 2*).—Among studies the progress of which is reviewed are the production of *Ephedra sinica*, breeding of hardy deciduous fruits, genetics of hardy double and hardy thornless roses, breeding of the tomato, development of drought-resistant sweet corn, and the effect of soil management practices on the growth of shelterbelt trees.

[Olericultural studies by the Illinois Station], J. W. LLOYD, J. P. MCCOLLUM, W. A. HUELSEN, and K. J. KADOW (*Illinois Sta. Rpt. 1937, pp. 281–295, 296*).—Progress reports are given on the following investigations: Response of vegetables to complete fertilizers, cover crops for truck crop soils, effect of time and duration of cutting on asparagus production, value of N for asparagus, variety tests of tomatoes and cabbage, breeding of yellow varieties of sweet corn, planting rates for sweet corn in normal and dry seasons, breeding of the tomato, value of manure for the greenhouse tomato crop, breeding of the lima bean, and the time of planting horseradish.

Waxing vegetables, R. B. HARVEY. (Minn. Expt. Sta.). (*Minn. Hort., 67 (1939), No. 9, p. 173, fig. 1*).—Information is given as to procedure, effect on keeping quality, wax removal, etc.

Changes in the composition and rate of growth along the developing stem of asparagus, C. W. CULPEPPER and H. H. MOON. (U. S. D. A.). (*Plant Physiol., 14 (1939), No. 4, pp. 677–698, figs. 6*).—Analysis of segments of asparagus stalks showed the total solids to vary greatly in amount at different points along the stalk. The total solids were lowest in a zone several centimeters below the tip, varying somewhat with the length of the stalk. In stalks of intermediate length the curves representing the relationship were distinctly U-shaped, the lowest total-solids content being found in the central portion. Apparently, the lowest solids occur in the region between that at which growth is at a maximum and the point where it ceases. Total sugars were highest at the base and decreased rapidly to a low value near the tip. Total N was lowest in the basal portion and increased rapidly in amount in regions near the tip. The elongation of the stalk was accompanied by hydration of the cells, which apparently continued until the cell walls became sufficiently rigid to check the process. Changes in total astringency were very closely correlated with changes in total N.

Three new varieties of bush lima beans, W. A. HUELSEN (*Illinois Sta. Bul. 461 (1939), pp. 105–120, figs. 7*).—Information is offered relating to the parentage

plant and fruit characters, yielding capacities, and value for canning, freezing, and fresh table use of three new varieties—Illinois Large Podded, Baby Potato, and Early Baby Potato—developed in the station breeding program.

On the quantities of nitrogen, phosphoric acid, potash, and lime removed from the soil by a crop of Roscoff broccoli during its growth, E. VANSTONE and C. E. H. KNAPMAN (*Jour. Pomol. and Hort. Sci., 17 (1939), No. 2, pp. 85–98, figs. 2*).—The average amounts of nitrogen, phosphoric acid, potash, and lime removed by Roscoff broccoli from an acre of soil were, respectively, 204, 70, 240, and 110 lb. As to chemical composition of the plants, there was a general similarity irrespective of the locality in which grown or the manurial treatment. Nutrient materials were removed from the soil continuously during the whole growth period. The dry matter of the curd contained no less than 40 percent of protein and that of the leaves 20 percent. Good quality curds differed from those of inferior quality by having a higher percentage of potash and a lower percentage of nitrogen.

Effects of variation in the supply of potash to lettuces grown under glass, R. M. WOODMAN (*Jour. Pomol. and Hort. Sci., 17 (1939), No. 2, pp. 167–180*).—Working with May King lettuce grown in sand supplied with six nutrient solutions differing only in their content of potassium sulfate, the author observed that there was very little differential response over a wide range of concentrations. A lack of potash gave, at first, a leaf of slightly darker green, later showing chlorosis, and resulted in such rapid and severe scorch and withering of the older leaves that ultimately a characteristically small, narrow, relatively tall, and erect plant resulted. Leaf scorch also resulted from small applications of potash, even when not small enough to cause a serious reduction in size of the plant. Large applications of potash had no apparent effect in hastening maturity, as did large applications of nitrogen or phosphorus.

The "Greengold"—a new family size squash, A. E. HUTCHINS. (Minn. Expt. Sta.). (*Minn. Hort., 67 (1939), No. 9, p. 168, figs. 2*).—A brief account regarding the origin, growth and fruit characters, and uses.

Nutrient uptake by the tomato plant, A. H. LEWIS and F. B. MARMOY (*Jour. Pomol. and Hort. Sci., 17 (1939), No. 3, pp. 275–283*).—Studies of the course of the uptake of 12 elements—nitrogen, phosphorus, calcium, magnesium, potash, sodium, iron, manganese, copper, chlorine, sulfur, and boron—by tomato plants supplied chemical nutrients and liquid manure showed that the rate of uptake follows the rate of dry matter production fairly closely, being slow in the early stages of growth, attaining a maximum in June and July, and then declining. The ratio of nitrogen : phosphoric acid : potassium oxide was fairly constant throughout the life of the plants. Horse and cow manures, though beneficial, are considered unbalanced nutrients for the tomato but are useful in supplying lesser elements and in maintaining the soil in good physical condition. The results suggested the desirability of a nutrient supply of more or less constant composition with regard to nitrogen, phosphoric acid, and potassium oxide, approximately a 1 : 1 : 2 ratio.

[Pomological studies by the Illinois Station], J. C. BLAIR, M. J. DORSEY, J. S. WHITMIRE, W. A. RUTH, H. W. ANDERSON, R. L. MCMUNN, and A. S. COLBY (*Illinois Sta. Rpt. 1937, pp. 263–277, 278, fig. 1*).—Among investigations the progress of which is discussed are apple breeding; apple tree training and pruning; effect of fertilizer and cultural treatments on the fruiting and growth response of apple trees; effect of bordeaux mixture, with and without oil, on the wilting of foliage; thinning of the Yellow Transparent apple; removal of spray residues; status of the apple measles disorder; peach breeding; winter injury to peaches; effect of dry summer weather on the efficiency of fertilizer applica-

tions; cause of the dropping of immature peach fruits; relation of hot, dry summers on subsequent winter injuries of apple and peach trees; response of apple varieties to injurious winter temperatures; cherry rootstocks; varieties of small fruits and nuts; and breeding of the gooseberry.

Root studies, VII–IX, W. S. Rogers (*Jour. Pomol. and Hort. Sci., 17 (1939), Nos. 1, pp. 67–84; 2; pp. 99–140, pls. 9, figs. 7*).—Three papers are presented in continuation of this series (E. S. R., 74, p. 488).

VII. *A survey of the literature on root growth, with special reference to hardy fruit plants* (pp. 67–84).—Herein is presented a historical survey with a bibliography of 118 papers relating to root growth, particularly that of hardy fruit plants.

VIII. *Apple root growth in relation to rootstock, soil, seasonal, and climatic factors* (pp. 99–130).—Four years' observation in glass-sided trenches established beneath 14-year-old Lane Prince Albert trees on Malling IX, XVI, and I stocks located in an apple orchard at the East Malling Research Station showed great contrasts in amount of growth in accordance with the known vigor of the three stocks. There was, however, little difference in appearance between the individual absorbing roots, and the mean growth rate per root in the three stocks was similar. The growing roots were white and succulent, about 0.3 to 2 mm. in diameter, with root hairs from 0.025 to 0.075 mm. long. Growth rates varied from 0 to 0.4 mm. per day, with 3 mm. common during active periods. Suberization usually occurred at between 1 week and 1 mo. of age. Root growth was closely correlated with soil temperature. Some growth occurred in winter at soil temperatures of from 35° to 45° F. Active development began at 45° and increased with rising temperatures up to 69°, the maximum recorded. Similarly, root growth decreased with declining temperatures. A check in root growth under warm soil conditions usually coincided with a drying of the soil. Root growth began before the leaves unfolded and continued after shoot growth ceased. A peak was reached in June or July, followed by a decline and a subsequent rise.

IX. *The effect of light on growing apple roots—a trial with root observation boxes* (pp. 131–140).—Working with young Malling I and II apple trees growing in glass-sided observation boxes, the author noted no well-marked, negatively heliotropic response when the roots were exposed to light. Continuous exposure to daylight severely checked root growth and hastened suberization. A statistically significant reduction in root length followed weekly exposures for 30 min. during early summer, when light intensity was high, but not in late summer and autumn.

Economical fertilizers for orchard soil fibre, F. W. Hofmann (*Va. State Hort. Soc. Rpt., 44 (1939), pp. 166–173*).—A series of plats established on a field of Dunmore soil, the chemical composition of which is given, were sown to winter rye on November 12 after treatment on October 13 with various fertilizers, including N material alone and N combined with phosphates and K materials. Measurements taken the following spring on selected rye plants showed the effectiveness of the NP combinations. The dry weights of the total grain and straw harvested on June 19 showed the highest yields on the plats receiving a 10–10–5 NPK mixture. To meet the conditions of loss and depletion of organic fiber, the author suggests that a plan of N and P fertilization appears to be the most economical method.

Magnesium-deficiency of fruit trees, T. Wallace (*Jour. Pomol. and Hort. Sci., 17 (1939), No. 2, pp. 150–166*).—Following a discussion of the present status of knowledge relative to Mg deficiency in economic plants and the possible role of Mg in plants, the author presents evidence of deficiency of this element in apple trees in three areas of England and suggests that the composition of the

leaves of terminal shoots may be used as a means of determining the condition of the foliage with respect to supplies of Ca, Mg, and K. The amounts of Ca and Mg in inadequately supplied apple leaves are similar to those in adequately supplied tobacco leaves.

Present status of the apple rootstock and double-working trials in eastern Canada, D. S. Blair (*Sci. Agr.*, *20* (*1939*), *No. 2*, *pp. 150–154*).—Discussing the rootstock situation in eastern Canada, where one of the major problems is winter injury to the trunk and base of main scaffold limbs, the author reports that, on the basis of investigations extending over many years, certain hardy Russian varieties, such as Hibernal, Charlamoff, Antonovka, and Anis, suffer no trunk or crotch injury, bark splitting, sunscald, or any of the ailments noted in economic varieties such as McIntosh. As a result, Hibernal, Antonovka, and Virginia Crab are recommended as rootstocks and trunks for better varieties. So far, Hibernal and Charlamoff are the most vigorous of the intermediates under test; and the former, because of its strong, broad-angled branching system, is deemed the better of the two.

The influence of the intermediate in double worked apple trees: Nursery trials of the "stem-builder" process at East Malling, N. H. Grubb (*Jour. Pomol. and Hort. Sci.*, *17* (*1939*), *No. 1*, *pp. 1–19*).—Using as rootstocks the very dwarfing Malling IX and the very vigorous Malling XII, as intermediates three stem-builder varieties of apples from south Germany, and as scions the Early Victoria and Newton Wonder varieties, the author observed that the stem builders did produce trees with stouter trunks and a larger proportion of good nursery trees and tended to even up somewhat the influences of the rootstocks. However, the effects of the Malling IX and XII rootstocks greatly outweighed the immediate effects of the intermediates, both in growth and in fruiting. In fruiting responses the trees on IX and XII behaved, in general, according to expectation, regardless of the intermediates.

The influence of "stem-builder" intermediates on apple root systems, W. S. Rogers, A. B. Beakbane, and C. P. Field (*Jour. Pomol. and Hort. Sci.*, *17* (*1939*), *No. 1*, *pp. 20–26*, *pls. 3*, *fig. 1*).—Studies of the conformation and relative size of the root systems of 24 double-worked apple trees, namely, Early Victoria scions on Malling IX and XII, with 5-ft. intermediate trunks of Normanischer Ciderapfel and of Early Victoria as a control, showed that the Normanischer Ciderapfel trunk had reduced the difference in size due to rootstock by invigorating the trees on Malling IX. The morphological characteristics of the rootstocks were not influenced by the intermediate. Observations on the main roots of 480 Early Victoria and Newton Wonder trees on Malling IX and XII and seedling roots with 5-ft. intermediates showed that none of the intermediates had materially altered the morphological characteristics of the rootstocks, nor did they eliminate variations among the seedling roots. Weighings of the root systems with stock trunks attached showed that the difference in vigor of the root systems found normally between Malling IX and XII was not eliminated, although it was somewhat modified by the intermediate trunks.

Apple breeding program: Cedar rust inheritance, R. C. Moore. (Va. Expt. Sta.). (*Va. State Hort. Soc. Rpt.*, *44* (*1939*), *pp. 163–166*).—Of some 100 seedlings fruiting at the station, 2 show promise for the grower. In addition, there are some 3,000 seedlings which have not yet reached fruiting. Among parents used are Winesap, Delicious, Lowry, Jonathan, Rome Beauty, and York Imperial. The cross Jonathan × Rome Beauty produced seedlings which were all susceptible to cedar rust, while the crosses Arkansas Black × Mother and Arkansas Black × Delicious produced rust-resistant progeny. Winesap × Rome Beauty and Winesap × Jonathan produced seedlings about half of which

were resistant to cedar rust. Winesap × Delicious produced about three resistant to one rust-susceptible seedling.

Correcting alternate bearing of apples, F. S. Howlett. (Ohio Expt. Sta.) (*Ohio State Hort. Soc. Proc., 72 (1939), pp. 80–88*).—In this general discussion of the factors underlying and influencing annual and alternate-year fruiting in the apple, the author discusses briefly the results of investigations to determine the amount of fruit thinning required to assure the production of a satisfactory crop in the following off year. Stayman Winesap, Delicious, and Northern Spy trees which had been bearing alternately for at least 10 yr. were each divided into halves. One half was thinned 21 days after petal fall and the other half 3 weeks later, in both cases so that there was only one apple to each four vigorous clusters. In all cases early thinning sharply reduced the crop of the year of thinning, and in all cases early thinning greatly increased the crop of the succeeding year as compared with late thinning. In the third year the tree halves given the original early thinning produced a somewhat smaller crop in most instances. The possibility of controlling crops by limiting bee activity is suggested.

***Developmental studies in the apple fruit in the varieties McIntosh Red and Wagener.*—I, Vascular anatomy**, M. MacArthur and R. H. Wetmore (*Jour. Pomol. and Hort. Sci., 17 (1939), No. 3, pp. 218–232, pls. 2, figs. 5*).—Study of flower buds and developing fruits collected from adjacent McIntosh and Wagener trees growing at the Dominion Experimental Farm, Kentville, Nova Scotia, showed certain differences in the vascular anatomy of the two varieties. The outline of the primary vascular bundles in McIntosh approached that of a circle, while in Wagener there was a lobed outline giving the appearance of an inner and outer circle. The line of division between pith and cortex was very irregular in McIntosh and regular in Wagener. The ovules of Wagener were longitudinally oriented in the bipartite locules, one ovule in each half of the locule. In McIntosh there was no such regularity. The core of the McIntosh was open, while that of Wagener was developmentally closed. There was no evidence of carpel polymorphism. The authors suggest that the fleshy part of the fruit external to the core line is a fleshy floral cup.

Studies with modified atmosphere storage of apples, R. M. Smock and A. Van Doren. (Cornell Univ.). (*Refrig. Engin., 38 (1939), No. 3, pp. 163–166, figs. 2*).—Certain modifications in the CO_2 and O_2 percentages in the storage atmosphere were found beneficial in the keeping of McIntosh apples. These changes permitted the successful holding of fruit at a moderate temperature, 40° F., which was itself helpful in checking the development of brown core. One of the most striking observations was the marked residual effect of certain atmospheres on the duration of the marketing period following removal from storage. Cortland apples responded very similarly to McIntosh as regards firmness, but proved very subject to scald and are not recommended for modified atmosphere trials. The possibility in using ozone in the modified atmosphere chambers for control of scald is discussed.

Chemical determination of ethylene in the emanations from apples and pears, E. Hansen and B. E. Christensen. (Oreg. Expt. Sta.). (*Bot. Gaz., 101 (1939), No. 2, pp. 403–409*).—A chemical method based upon a bromination procedure previously described (E. S. R., 81, p. 215) was adapted for determining the ethylene contained in the emanations from apples and pears. Solubility tests indicated that ethylene is the active gas evolved by the fruits, with similar unsaturated hydrocarbon gases, such as acetylene, propylene, and butylene, not present in sufficient amounts to be detected by the bromination procedure. The amounts of ethylene produced by several varieties of apples and pears

during the ripening process were measured and were found to be within a range of <0.001 to 0.280 cc. per kilogram-hour.

Refrigeration of apples and pears, H. H. PLAGGE. (Iowa Expt. Sta.). (*Refrig. Engin., 38 (1939), No. 2, Sect. 2, pp. 1–8*).—This is a general discussion of the principles and practices of handling and storing fruits, based on the results of recent investigations.

Pruning bearing peach trees, C. H. RAGLAND and E. A. CURREY (*Miss. Farm Res. [Mississippi Sta.], 2 (1939), No. 12, p. 7, figs. 3*).—Observations at the Delta Substation of the effects of different types of pruning showed the value of light pruning as compared with severe pruning. Some pruning is needed in order to insure regular production of good-quality fruits. Over 3 yr., 1934–36, Elberta trees set in 1931 and pruned not at all, lightly, moderately, and severely yielded an average per tree of 54.66, 56.16, 48.76, and 29.49 lb. of marketable fruit, respectively. In 1937 the yields were, respectively, 329.9, 426.9, 399.8, and 400.9 lb. of marketable peaches. It is pointed out that the removal of too many small twigs on the main scaffold limbs should be avoided.

Photosynthetic studies of mutational barrenness in the Montmorency cherry, J. W. CRIST. (Mich. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 59 (1939), No. 7, pp. 547–553, figs. 2*).—In this second contribution on the general subject (E. S. R., 82, p. 340) the author presents the results of analyses for free-reducing substances, starch, and polysaccharides other than starch in samples of spurs taken at intervals between June 6 and August 3, 1934, from a barren and a normal tree. A general comparison of the two trees showed that the normal ran higher in free-reducing substances and starch and lower in polysaccharides other than starch. There was a relatively low rate for photosynthetic activity and for the production and accumulation of starch, both prior and subsequent to fruit-bud formation in the barren tree. Photosynthesis determination made in 1936 on samples of leaf tissue collected by the leaf-punch method led to the inference that barren mutants in the Montmorency cherry are, as compared with normal trees, photosynthetically deficient during the period of fruit-bud initiation, differentiation, and early development, but not so with respect to the later part of the season or the season as a whole. Measurements in 1937 of the increase in diameter of marked twigs on wood formed the preceding year showed that the relative gains in the purely vegetative growth of the barren forms for the entire season exceeded those of the normal by significant differences. When twigs were deflorated on the normal trees they made gains similar to those of the mutationally barren branches. Apparently, in the barren tree there is some basic peculiarity of the genetic composition that causes the nutrient supply to be utilized directly and completely for vegetative growth. Fruit-bud differentiation is not dependent solely on the presence of organic materials but also on their localization, apparently in the spurs as the principal fruit-bud-forming structure.

Incompatibility and sterility in the Gage and dessert plums, M. B. CRANE and A. G. BROWN (*Jour. Pomol. and Hort. Sci., 17 (1939), No. 1, pp. 51–66, pls. 3*).—In presenting data on the results of self- and cross-pollinations among a large number of European plum varieties, the authors point out that, with respect to self-fruitfulness, varieties may be grouped into three provisional classes—completely self-unfruitful, slightly self-fruitful, and self-fruitful and capable of developing full crops with their own pollen. Concerning cross-pollination, three groupings are suggested—cross-incompatible, partially compatible, and compatible. The proportion of fruit set from cross-pollination in the three classes was very similar to that set in the three corresponding self-pollination classes. All cross-pollinations, where self-fruitful kinds were used either as

pollen or ovule parents, were always effective. The plums in the greengage group of varieties, all very similar in their morphological characters and their incompatibility reactions, suggested that these are seedlings from parents recessive for several characters or possibly may have arisen as bud sports. Degrees of generational sterility occur and are expressed by aborted pollen and imperfectly developed or nonviable seeds.

Experiments in plum pollination, O. EINSET. (N. Y. State Expt. Sta.). (*Gartenbauwissenschaft, 13 (1939), No. 3, pp. 318–326*).—In controlled pollination trials it was observed that the pollen of a number of European-type plums (such as Clyman, Oullins, Reine Claude, Rivers Early Damson, Tragedy, Victoria, and Yellow Egg) gave fair sets of fruit on Japanese-type varieties, but the seeds failed to grow when stratified and planted. The reciprocal crosses with Japanese pollen on European types were almost wholly unfruitful. Of a great number of Japanese and European plums tested for self-fruitfulness, many were completely unfruitful, yet a fair proportion were self-fruitful, including such well-known kinds as Lombard, Gueii, and Victoria. The author concedes that the wide use of certain of the fully self-fruitful plum varieties may well be associated with their self-fruitfulness.

Physiological breakdown in stored Monarch plums, W. H. SMITH (*Jour. Pomol. and Hort. Sci., 17 (1939), No. 3, pp. 284–291, figs. 2*).—Sorted at the time of harvest into two groups—(1) firm ripe, three-fourths to full color, and (2) hard ripe, one-fourth to three-fourths purple color—Monarch plums were stored at 65°, 50°, 45°, 40°, 37°, 34°, and 31° F. for different periods. The riper group showed the earlier appearance and greater development of physiological breakdown at each temperature. The minimum percentage of break-down occurred at 34°. Two distinct types were noted, internal browning and jellying, with probably different causal relations.

Olive production in Italy and Egypt, W. V. CRUESS (*Canner, 89 (1939), No. 26, pp. 12, 13, 28, figs. 2; 90 (1939), No. 1, pp. 18, 28*).—This article contains facts and observations obtained during a tour of the two countries.

Metabolic and storage investigations on the banana, C. W. WARDLAW, E. R. LEONARD, and H. R. BARNELL (*Imp. Col. Trop. Agr. [Trinidad], Low Temp. Res. Sta. Mem. 11 (1939), pp. IV+61, pls. 20*).—Stating that the banana, unlike most fruits, ripens to an edible condition even though cut at an early stage of development, and therefore actual size does not provide an accurate guide to maturity, the authors present the results of physiological studies. During the development of the bunch, sugars remain at a very low concentration, while starch is accumulated rapidly. The biochemical status of each of the several export grades, based on carbohydrate composition, was not found in this study to be closely or specifically related to maturity. Fruits of heavy grade showed definite ripening changes during the first 24 hr. after cutting when held at tropical temperatures. Ripening was marked by increased metabolic activity involving increased utilization of O_2, increased CO_2 output, a rise in pulp temperature, and rapid changes in the principal metabolites. If the fruit was held at 53° F., these changes were notably retarded in rate. Eating quality could not be closely correlated with chemical composition as there was a comparatively wide range of starch and sugars within the limits of the eating-ripe condition as judged by skin color. Chilling resulted in astringency and poor eating quality, with starch, acid, and glycoside contents tending to be high and sugar content low. Extreme chilling resulted in greatly delayed ripening, the starch hydrolysis mechanism being notably affected.

Fruit from plantations affected by *Cercospora* leaf disease was characterized by pulp of a more or less buff color and a tendency to ripen prematurely.

Studies with the hybrid I. C. 2 banana showed this seedling capable of yielding good bunches, not fully equal to Gros Michel in symmetry but indicating promise as a substitute therefor.

The conditions existing in ship holds designed for banana transport are discussed.

Production and consumption of ethylene by ethylene-treated bananas, R. C. NELSON (*Plant Physiol., 14 (1939), No. 4, pp. 817–822, figs. 2*).—Measurements of the ethylene in bell jars in which were placed bananas in the green stage, with and without added ethylene, showed a loss of the gas which could be explained only on the basis of consumption of ethylene by the banana in the course of its ripening. The author believes that the ethylene is consumed in the hydrolytic processes associated with ripening.

Growth of citrus and walnut trees as affected by pH, I–III, A. R. C. HAAS. (Calif. Citrus Expt. Sta.). (*Calif. Citrog., 24 (1939), Nos. 10, pp. 351, 364, 379, figs. 11; 11, pp. 388, 406–408, figs. 2; 12, pp. 430, 458, figs. 7*).—The generally accepted assumption that citrus groves thrive under a rather wide pH range was disproved in a series of carefully conducted laboratory and field studies in which it was shown that citrus and walnut trees, although tolerant of low and high pH conditions, made their best growth in acid rather than alkaline solutions or soils. It is believed that the erroneous view regarding pH resulted largely from the use of faulty methods of preparing soil samples for pH determination. With adequate technics, the results obtained in solution cultures and in soil cultures agreed very well with records on field data. The moisture content of the soil was found a potent factor in pH determinations.

Temporary effect of an irrigation on pH of soil, A. R. C. HAAS. (Univ. Calif.). (*Citrus Leaves, 19 (1939), No. 11, pp. 1, 2, 22*).—Observations on soil samples obtained before and after irrigation in a 9-year-old navel orange orchard located on Ramona sandy loam soil showed that the average pH of the rather dry soil before irrigation is lower and therefore more acid than that of samples taken after irrigation. The results suggest the need of considering soil-moisture content in studies involving the pH values of soil.

Progress report on citrus hybridization—propagation, J. P. TORRES. (U. S. D. A.). (*Philippine Jour. Agr., 10 (1939), No. 2, pp. 95–119, pls. 9*).—In this discussion of methods employed in the propagation and growing of cirtus hybrids, the author reports much better survival following the transplanting of plants averaging about 120 cm. tall than of those averaging about 60 cm. The testing period of citrus seedlings was shortened by top working hybrids on mature mandarin trees. The growth of hybrids with poor root systems was aided by providing them with a double root system through inarching combined with tongue grafting.

The curing and colouring of New Zealand lemons, J. B. HYATT and O. H. KEYS (*New Zeal. Jour. Sci. and Technol., 20 (1939), No. 6B, pp. 318B–340B, figs. 7*).—Using lemons in the green or silver stage, the authors found that exposure of the fruits to warm temperatures and high relative humidity for from 4 to 6 weeks resulted in a material decrease in peel thickness and a pronounced increase in juice percentage and in the total amount of juice. There was also a gain in citric acid, vitamin C, and total solids in the juice. The introduction of coal gas, one part per thousand, into the curing chamber during the first week accelerated coloring and the various changes indicated. The most satisfactory conditions were a temperature of 70° F., a relative humidity of 90 percent, and gas during the first week.

Physiological studies of lemons in storage, E. V. MILLER and H. A. SCHOMER. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 59 (1939), No. 8, pp. 601–607*).—Bio-

chemical studies were made of California lemons stored at 32°, 36°, 40°, 50°, and 60° F. During the period of storage, reducing and total sugars in the peel decreased, while total acids and glycosides increased. The percentage of reducing and total sugars in the flesh diminished during storage. Varying amounts of acetaldehyde were found in the flesh at the time of the mid-storage and final sampling dates. No relationship was found between the above-mentioned substances and the development of pitting and membranous stain in the fruit. Reductase activity of the peel, as measured by the time rate of reduction of potassium permanganate solution, was consistently lower for the samples stored at 32°, 36°, and 40° than for those stored at 50° and 60°. Inasmuch as these lower temperatures (32°, 36°, and 40°) are most conducive to pitting of lemons in storage, it is suggested that oxidizing enzymes may play a role in the development of this disorder.

Notes on bud differentiation in Carabao mango (Mangifera indica L.), E. A. LANUZA. (U. S. D. A.). (*Philippine Jour. Agr., 10 (1939), No. 2, pp. 131-151, pls. 7*).—Observations on bud differentiation in smudged and unsmudged Carabao mango trees indicated that smudging apparently shortens the dormancy of buds, only from 6 to 17 days being required following treatment to reveal the signs of differentiation. Externally, the first manifestation of activity of the bud was the loosening of the scales and the elongation and slight broadening of the inner scales. Microscopic examination of the buds showed that growth activity on apical meristems, on the axils of the scales, and in the foliage leaves occurred in from 6 to 17 days of continuous smudging. The period was shorter in older dormant buds than in buds taken from relatively young twigs.

The effect of high-temperature sterilization on the Solo papaya, W. W. JONES, J. J. HOLZMAN, and A. G. GALLOWAY. (Coop. U. S. D. A.). (*Hawaii Sta. Cir. 14 (1939), pp. 8*).—Four shipments in November and December of papayas following heat treatment were found, upon arrival in California, to be in good condition, with fine flavor and very little decay. However, a fifth shipment made in January arrived in very poor condition, apparently related to different climatic conditions prevailing at the time of harvest. It was suspected that a rainy period resulted in increased moisture content of the fruits, with a resulting decrease in tolerance to the sterilization process. On this assumption, Solo papayas in ripe, firm-ripe, and mature-green stages were given a 6-hr. conditioning at 100° F. at 60 and 100 precent relative humidity, followed by an approach period at 110° with 60, 80, or 100 percent r. h. before the final 8-hr. heat period at 110° and 100 percent r. h. The conditioning period with air at 100° and 60 percent r. h., followed by 2.5 hr. at 110° and a relative humidity of 60 percent prior to the final 8 hr., gave the minimum injury. In general, ripe fruits were less tolerant than firm-ripe or mature-green fruits. After treatment, fruits should be aired and cooled at atmospheric temperatures and after packing should be held at 50° for at least 10 days.

Two new varieties of almond: The Jordanolo and the Harpareil, M. N. WOOD (*U. S. Dept. Agr. Cir. 542 (1939), pp. 13, pl. 1, figs. 7*).—Two promising new varieties of almond, originated by breeding and now released for commercial propagation and distribution, are described. The Jordanolo produces dense, thrifty foliage, yields heavily, and resists attacks by mites. The nuts are easily and cheaply harvested and hulled. The shell is soft and the kernel content high. The kernels are free from doubles, resemble those of the Jordan in shape and size, blanch well, and have a tender texture. This variety is considered well adapted to growth conditions in California, its only weakness being its early blooming habit. The Harpareil is a vigorous grower, produces dense

foliage, and bears heavily, but is more irregular in bearing than the Jordanolo. The nut closely resembles the Ne Plus Ultra, but the kernels are superior to those of that variety. The two new varieties are incompatible and therefore cannot pollinate each other.

Florida pecan experiments, G. H. BLACKMON. (Fla. Expt. Sta.). (*Southeast. Pecan Growers Assoc. Proc., 32 (1938), pp. 14–21*).—Variety was found to be an important factor in fertilizer and cover crop responses, the high-producing kinds showing the greater responses. Curtis and Kennedy trees, located on Coxville fine sandy loam soil in Bradford County, gave profitable increase from fertilizer applications, particularly mixtures of N, P, and K. Favorable results were also secured with Moore trees located on Norfolk fine sandy loam in Jefferson County. For example, Moore trees set in 1912 averaged 1,361 lb. per acre when supplied with a 4-8-4 material in spring and sulfate of ammonia in summer, as compared with 476 lb. for the checks. Moneymaker trees did not respond as satisfactorily as did Moore, which gave the largest nut yields and greatest increases of any variety. Stuart trees on Norfolk fine sand responded in a moderate degree, the yields on the better plats being sufficient to show a small profit for fertilizers. In cover crop experiments with Frotscher, Moore, and Stuart pecans growing on Norfolk sandy loam in Jefferson County, all varieties responded favorably to winter legumes. Frotscher in vetch plats gave the highest and most consistent yields. In general, the best results were secured where fertilizer and cover crop treatments were combined.

Profitable yields of tung nuts from 5-year trees secured by cultivation, fertilization, C. DORMAN (*Miss. Farm Res.* [*Mississippi Sta.*], *2 (1939), No. 12, p. 4*).—This article points out the needs, particularly during the early years, for cultivation and fertilization to promote profitable returns.

[Floricultural studies by the Illinois Station], R. H. BRAY, F. F. WEINARD, and S. W. HALL (*Illinois Sta. Rpt. 1937, pp. 296, 297, 298, 299*).—Studies the progress of which is noted are the effective nutrient composition of greenhouse soils, hazards of overfeeding greenhouse roses, and the effect of fertilizers on the yield of the carnation.

Effect of photoperiod and temperature upon the growth of seedlings and cuttings, B. E. STRUCKMEYER and R. H. ROBERTS. (Wis. Expt. Sta.). (*Amer. Jour. Bot., 26 (1939), No. 9, pp. 694–697, figs. 10*).—Observations on seedlings grown from a single plant and cuttings taken from the same plant and both grown in different temperature locations with different lengths of day showed that both photoperiod and temperature exert an influence on variability of clons and seedlings. Under certain environmental conditions both seedlings and clons were uniform. Under other conditions they were variable in growth. Cuttings of *Antirrhinum*, *Centaurea*, and *Petunia* responded differently to photoperiod and temperature than did seedlings. The different response of cuttings from nonflowering and flowering plants to a single environment was found associated with differences in the anatomical structure of the original cuttings. Flowering of seedlings was found to be associated with the flowering structure of the stem.

The influence of size on the dry matter, mineral, and nitrogen content of hyacinth bulbs, J. HARGRAVE and F. C. THOMPSON (*Jour. Pomol. and Hort. Sci., 17 (1939), No. 3, pp. 185–194, figs. 3*).—In an investigation of the dry matter, mineral, and N contents of L'Innocence hyacinth bulbs of 6, 8, 10, 12, 14, and 16 cm. in size, differences were found between the various sized bulbs in all the constituents. With respect to dry matter, the bulbs were divided into two rather distinct groups, the three smaller sizes being significantly higher in dry matter than the three larger. The 16-cm. bulbs contained a signifi-

cantly higher percentage of K, P, and N than did any other size. When the results were translated into terms of fresh material, significant differences still existed between the sizes, the general tendency being much the same as on the dry matter basis.

Studies on the nutrition of tulips and narcissi, C. BOULD (*Jour. Pomol. and Hort. Sci., 17 (1939), No. 3, pp. 254–274, pls. 3, figs. 4*).—In the case of the King Alfred narcissus and the Farncombe Sanders tulip supplied different nutrient solutions, it was observed that the omission of K produced no noticeable external effects on foliage or flowers but did result in a reduction in bulb weight increase in both species. The omission of N produced typical deficiency symptoms in the foliage and a significant reduction in bulb weight increase. The treatments produced marked changes in the N and inorganic contents of the bulbs but little effect on carbohydrates. In all cases the omission of an element resulted in a lower percentage of that element in the bulb.

Seasonal variations of starch content in the genus Rosa, and their relation to propagation by stem cuttings, D. BRANDON (*Jour. Pomol. and Hort. Sci., 17 (1939), No. 3, pp. 233–253, figs. 5*).—Making use of an extensive collection of species and varieties of roses growing on the grounds of the University of Reading, England, the author took cuttings at various times of the year for study as to rooting tendencies and starch accumulation. In the case of hardwood cuttings, the highest rooting was secured in October-December collections. June proved the most effective month for softwood cuttings. None of several chemicals was found to give a pronounced increase or acceleration in rooting, and ethylene chlorohydrin and thiourea depressed rooting percentages. The adjustment of indoleacetic acid solutions to pH 5.0 and 7.0 had no effect on rooting response. With respect to starch accumulation, botanically related species and varieties fell into the same groups, suggesting that starch fluctuation is a genetically related phenomenon among species of *Rosa*. Starch accumulation appeared to bear no relation to the ease of rooting.

Color and keeping qualities of cut flowers, M. S. NEFF (*Bot. Gaz., 101 (1939), No. 2, pp. 501–504*).—Investigations with the Hollywood rose, a variety said to take on a faint bluish cast under certain storage conditions, showed that light, whether from a screened arc lamp, direct from a Mazda lamp, or filtered through a copper sulfate solution, is of great aid in extending the life of cut flowers in water at room temperature and also in preventing the tendency of red flowers to turn blue. The inhibiting effect on color change was particularly true under conditions of dry storage or when the stems were immersed in appropriate solutions such as potassium nitrate and sugar.

FORESTRY

Report of the Chief of the Forest Service, 1939, F. A. SILCOX (*U. S. Dept. Agr., Forest Serv. Rpt., 1939, pp. IV+48*).—Included in this general administrative report is information relating to national forestry problems, forestry legislation, the national forests, forestry research, and protection of forests from fire, insect, and fungus damage. The research for which results are noted includes the feasibility of lighter cutting, substitution of chemical for mechanical seasoning of heavy timber, use of lignin in storage batteries, and range management and improvement.

A method for determining the quantity of foliage per acre of woodland, S. F. POTTS. (U. S. D. A.). (*Jour. Forestry, 37 (1939), No. 12, pp. 922, 923*).—Equations are presented to assist in determining the ratio of leaf area to ground area. Using the proposed methods, the author estimated that oak types of

average stocking in New England would apparently support an average of between 3 and 6 acres of foliage per acre of ground.

The calcium content of the foliage of forest trees, R. F. CHANDLER, JR. ([New York] *Cornell Sta. Mem. 228 (1939), pp. 15, figs. 4*).—In the foliage of five forest-tree species—beech, cucumbertree, trembling aspen, red cedar, and white pine—the calcium content, either on a percentage or on an absolute-amount basis, was found to increase progressively throughout the growing season. The calcium content of the foliage of evergreen trees remained fairly constant during the winter months. The longer the foliage of a single species remained on the tree, the higher was its calcium content.

The trees were placed in three groups: (1) Species averaging more than 2 percent of calcium in their foliage—tulip poplar, red cedar, basswood, black locust, mockernut hickory, bitternut hickory, white cedar, hophornbeam, trembling aspen, white ash, and black cherry; (2) from 1 to 2 percent of calcium—shagbark hickory, American elm, sugar maple, Norway spruce, white oak, red oak, yellow birch, chestnut oak, white pine, and balsam fir; and (3) less than 1 percent of calcium—red maple, red pine, hemlock, beech, Scotch pine, and red spruce.

Effect of five kiln temperatures on the germinative capacity of longleaf pine seed, R. C. RIETZ. (U. S. D. A. and Univ. Wis.). (*Jour. Forestry, 37 (1939), No. 12, pp. 960–963, figs. 5*).—Cones collected from 30- to 60-year-old trees growing in open stands on the De Soto National Forest in Mississippi and with a mean moisture content of 35 percent at the time of placement in the kilns were submitted to various temperatures ranging from 115° to 135° F. for 8-, 12-, and 16-hr. durations. At 115° and 120°, there was no significant difference between the three time intervals. At the higher temperatures, time interval was a factor in germination, the longer the interval the lower being the viability. As to temperature effects, increasing the temperature by 5°-intervals above 115° produced significant decreases in the percentage of resulting plants. The author recommends that fairly green longleaf pine cones be kiln-dried at 115° or at a relative humidity as low as 20 percent.

Layering in eastern white pine, H. J. LUTZ (*Bot. Gaz., 101 (1939), No. 2, pp. 505–507, fig. 1*).—An instance is cited where one of the bottom limbs of a white pine (*Pinus strobus*), when covered by a washing of mineral soil and organic debris, developed roots and assumed an erect habit of growth.

Report of planting experiment to determine the effect of root exposure on deciduous planting stock, A. H. BRIGGS (*Jour. Forestry, 37 (1939), No. 12, pp. 939–943, fig. 1*).—Studies in Oklahoma upon several species of trees used frequently in windbreak and farm woodlot plantings led to the conclusion that moderate exposure and drying of the roots of dormant deciduous seedlings are not necessarily detrimental to their survival. Some benefit and no harm resulted from the immersion of exposed trees in water as a reviving process. Fully dormant plants were less susceptible to injury from drying than those in the dormancy-breaking stage. Overwintering of trees in the heel-in beds did not affect their susceptibility to drying injury.

Growth following partial cutting in ponderosa pine, B. LEXEN. (U. S. D. A.). (*Jour. Forestry, 37 (1939), No. 12, pp. 943–946, fig. 1*).—An analysis of a method-of-cutting study in ponderosa pine established in 1913 and involving over 400 acres representing three types of cutting, namely, shelterwood, group selection, and scattered seed tree, disclosed the fact that the principal difference between treatments lay in the volume and average size of the material left after cutting. It was indicated that cutting may be so heavy in the absence of advanced reproduction that the productive capacity may be reduced for a

long period or, on the other hand, may be so light as to limit the establishment of reproduction. There was evidence that a heavy seed crop, followed by favorable growing conditions, may still be the controlling factor in reproduction. Apparently, a reserved stand somewhere between 4,000 and 8,000 bd.-ft. per acre represents a desirable condition.

Ten-year observations on the thinning of fifteen-year-old red pine, R. SCHANTZ-HANSEN. (Univ. Minn.). (*Jour. Forestry, 37 (1939), No. 12, pp. 963–966*).—The experiment was conducted on four one-tenth acre thinning plats established in 1927 in a dense 15-year-old red pine stand in the Cloquet National Forest, Minnesota. Spacings of approximately 4 by 4, 6 by 6, 7 by 7, and 9 by 9 ft. were utilized, with the number of trees following the 1927 thinning being 2,640, 1,530, 880, and 530 per acre, respectively. There were 12,680 trees per acre left on the check plat. On the thinned plats the greatest loss in the first 5 yr. was on the 4-by-4-ft. area. The first remeasurement, in 1932, showed some advantage, as indicated in diameter measurements, for the 7-by-7-ft. plat, and this advantage was maintained through the second 5-yr. period. All the thinned plats showed considerably better growth than the check and suffered less damage in a very severe sleet storm occurring in 1935.

Forest care, planting, and harvesting (*U. S. Dept. Agr., Sec. Agr. Rpt., 1939, pp. 148–153*).—Among items considered are the role of forests in soil and water conservation; the protection of forests from insects, disease, and fire; the handling of the timber felled by the New England hurricane; administration of the national forests with reference to grazing, wildlife conservation, recreational use, and lumber output; development of the Prairie-Plains tree-planting project; importance of privately owned forest lands; and cooperative handling of private forest lands.

Fire Control Notes, [January 1940] (*U. S. Dept. Agr., Forest Serv., Fire Control Notes, 4 (1940), No. 1, pp. II+46, figs. 19*).—Devoted to the technic of fire control, this quarterly contains, as usual, information relative to equipment, methods, records of fires, etc.

Factors affecting the costs of producing oak cordwood, L. I. BARRETT and J. F. RENSHAW. (U. S. D. A. et al.). (*Jour. Forestry, 37 (1939), No. 12, pp. 947–954, figs. 2*).—This article, based on experimental cuttings in Buncombe County, N. C., analyzes the relationship of the several steps in cordwood production and indicates the wages that are economically possible under different market prices for cordwood. Under the conditions of the study, an hourly wage of 30 cents would be practicable only with profit margins limited to 10 percent and wood selling at $9 per unit.

Costs of tractor logging in southern pine, R. E. WORTHINGTON (*U. S. Dept. Agr., Tech. Bul. 700 (1939), pp. 64, pls. 2, figs. 10*).—Dealing mainly with specialized types of motor transportation used in skidding operations (all of them adaptations of the crawler tractor), this study was carried on largely near Crossett, Ark. Only about one-fourth of the cost of tractor operating equipment was operating labor cost. Ownership costs of depreciation, interest, taxes, and insurance comprise another one-fourth, and about one-half of the total consisted of fuel, maintenance supplies and labor, repair parts and labor, and transportation of the crew. The performance in the individual cases in tractor skidding varied considerably, both in output and in cost, with the lowest costs associated with efficient tractor crews. All of the ground-skidding tractors, with one exception, showed rapidly increasing costs with increase in skidding distances. The use of a relay system of skidding whereby the logs were concentrated by a ground-skidding tractor and later skidded to the landing by an arch-skidding tractor did not prove to be as cheap as a system under which

the arch-skidding tractor bunched its own logs. The performance of the tractors here recorded was more efficient than that of tractors in other parts of the country for which records are available, even when allowances were made for differences in weight of timber, wages, and other items. Inventories of 240 acres of the Crossett tractor-logging area showed felling damage to the remaining stand to be much greater than skidding damage. Of 12 percent of the pines injured by felling, more than half were destroyed outright or died in the next 6 mo. Skidding injured 7 percent, with only 1 percent dead 6 mo. later.

Market channels for forest products, Tennessee and United States, C. E. ALLRED and F. M. FITZGERALD (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 95 (1939), pp. [1]+II+37, figs. 23*).—Maps and tables are included and discussed showing the lumber consumption by States and the origin of the lumber, shipments into and out of Tennessee, the channels of distribution in the United States and the various marketing channels, and the location of different types of lumber industries in Tennessee.

DISEASES OF PLANTS

Plant disease research (*U. S. Dept. Agr., Sec. Agr. Rpt., 1939, pp. 129, 130, 131, 144, 145, 147, 148, 158, 159*).—Reports of progress in the phytopathological research of the U. S. Department of Agriculture and the State experiment stations are given, particular reference being made to the breeding and selection of disease-resistant strains and varieties of many crop plants, including forest trees; sulfur dioxide fumigation for mold in Emperor grapes, and the use of carbon dioxide for cherries and apples to enhance their keeping quality and hold back transit or storage troubles; studies of physiological races of wheat rusts and the development of rust-resistant wheats; potato virus diseases and their transmission and elimination; the urgent need of fundamental studies on plant disease problems, examples of which are the plant-infesting nematodes and bacterial diseases that damage field crops, fruits, and vegetables; the virus-induced phony peach disease; white pine blister rust; and the Dutch elm disease.

[Studies of plant disease problems by the Illinois Station]. (Partly coop. U. S. D. A.). (*Illinois Sta. Rpt. 1937, pp. 60–64, 67–70, 71–73, 277, 278, 278–281, 297, 298, figs. 7*).—The status of research by the station on the following subjects is briefly reported upon: The selectiveness of corn hybrids for ear-rot resistance, by B. Koehler; the relations of chemistry, disease, and cold resistance in corn, by E. E. DeTurk, E. B. Earley, and J. R. Holbert; varietal tests of wheat and breeding and selection for mosaic resistance and report of new outbreaks of the disease, by Koehler, O. T. Bonnett, and H. H. McKinney; control of cereal smuts effected by lengthened storage time and less seed grain disinfectant, by Koehler; control of brown stele disease of strawberries by breeding and selection of resistant varieties, by H. W. Anderson and A. S. Colby; crown gall infection from root injury by deep cultivation and hereditary factors in root vigor of purple raspberries, by Colby; root and soft rots of calla and their control, abnormal flowers in chrysanthemum probably due to cultural disturbances, and early-season failure of *Euphorbia fulgens* for cut flowers and its partial amelioration by soil sterilization, all by F. F. Weinard and S. W. Hall.

[Abstracts of papers] (*Va. Acad. Sci. Proc., 1939, pp. 27, 44*).—The following are of interest to phytopathology: Spectroscopic Comparison of Extracts From Healthy and From Mosaic Infected Tobacco Leaves, by G. M. Shear and C. E. Cox, and Frenching of Tobacco Distinguished From Thallium Tox-

icity by **Spectrographic Analysis**, by G. M. Shear and H. D. Ussery (both Va. Expt. Sta.); and **Boron—An Essential Element in Plant Nutrition [and its relation to deficiency diseases]**, by E. R. Purvis (Va. Truck Sta.).

[Essays on phytopathology] (*In Agriculture in the Twentieth Century: Essays on Research, Practice, and Organization To Be Presented to Sir Daniel Hall. Oxford: Clarendon Press, 1939, pp. 261–307*).—The following are of special interest to phytopathology: Outlines of the History of Plant Virus Research, by R. N. Salaman (pp. 261–289); and Plant Protection, by J. C. F. Fryer (pp. 291–307).

[Papers presented at the Section of Vegetable Pathology] (*4. Cong. Internaz. Patol. Compar., Roma, 1939, vol. 2, Atti e Comun., pp. 355–387, pls. 11, figs. 4*).—The following papers (in Italian, French, or English) are presented: Aspects of the Problem of Resistance in Phytopathology (dealing with the toxicologic and metabolic forms of active protoplasmic resistance and illustrated with photomicrographs), by C. Sempio; Environal Influences on the Appearance and Development of Phytopathogenic Viruses, The Arrest or Lowering of Metabolism as a Necessary and Sufficient Condition of Predisposition to Infectious Cryptogams in Plants of Susceptible Varieties, and The Influence of Metals (Contact Effects) on the Excitation and Depression of Cell Multiplication in Normal and Pathological Tissues of Plants and Animals, all by V. Rivera; Marsh Spot, a Necrotic Disease of Pea-Seed, Caused by Mn-Deficiency, by H. L. G. de Bruyn; On the Possibility of Immunising Tobacco and Potato Plants Against Virus Diseases, by T. H. Thung; Cytologic Studies of Virus-Infected Plant Tissues, by J. Dufrenoy; Lipidic Degeneration in Plant Cells, by J. Dufrenoy, H. S. Reed, and C. Sempio; and A Comparative Study of the Virus and Deficiency Diseases of the Potato Plant, by H. M. Quanjer.

Bacterial diseases of plants [trans. title], C. STAPP (*Zentbl. Bakt. [etc.], 1. Abt., 144 (1939), No. 1–5, pp. 94–108, figs. 16*).—The author presents a general outline (58 references) of the present status of the more important bacterial diseases of plants of special interest to Germany.

Production of growth substance on peptone broth by crown gall bacteria and related nongall-forming organisms, S. B. LOCKE, A. J. RIKER, and B. M. DUGGAR. (Wis. Expt. Sta. et al.). (*Jour. Agr. Res. [U. S.], 59 (1939), No. 7, pp. 519–525, fig. 1*).—Single-cell cultures of virulent and attenuated crown gall bacteria (*Phytomonas tumefaciens*) and of *Bacillus radiobacter* were proved similar in capacity to produce growth substance when grown on peptone broth, but they differed widely in ability to induce overgrowths when inoculated into various plants. Determinations of growth substance were made according to Went's standard *Avena* technic on the unconcentrated medium. It is concluded that evidence seems lacking for the view that β-indoleacetic acid, or any other known growth substance produced in such cultures, has any direct major relation to the pathogenicity of crown gall bacteria.

The nature of growth substance originating in crown gall tissue, S. B. LOCKE, A. J. RIKER, and B. M. DUGGAR. (Wis. Expt. Sta. et al.). (*Jour. Agr. Res. [U. S.], 59 (1939), No. 7, pp. 535–539*).—The growth substances obtained by ether extraction from tomato crown gall tissue, tomato foliage, and cultures of crown gall bacteria (*Phytomonas tumefaciens*) on peptone broth all appeared to contain β-indoleacetic acid or materials exhibiting similar stability in hot acid and basic solutions. There was no evidence of the presence of auxin-a or auxin-b in these extracts. The growth substance measured might have come either from the plant or from the bacteria.

Diurnal cycle of spore maturation in certain powdery mildews, J. F. L. CHILDS. (Univ. Calif.). (*Phytopathology, 30 (1940), No. 1, pp. 65–73, figs. 3*).—

Periodic examination of powdery mildews not forming conidial chains (*Erysiphe polygoni* type) from *Phaseolus vulgaris* and *Euonymus japonicus* revealed a diurnal cycle of conidiophore development similar to that reported for *Erysiphe polygoni* on clover, the period of conidial abstriction occurring between 10 a. m. and 2 p. m. in both cases. Similar studies of powdery mildews bearing conidia in chains (*E. cichoracearum* type), from sunflower, rose, apple, aster, and cucumber, revealed that abstriction of conidia occurs between 6–8 a. m. and 2–4 p. m., and formation of conidia between 2–4 p. m. and 6–8 a. m. The catching of abstricted spores of *E. cichoracearum* on *Helianthus annuus* revealed a diurnal cycle of sporulation similar to that apparent from microscopic examination. From microscopic examination of conidiophores of powdery mildew of sunflower it is believed that both the basal cell and the cell next above it (each with two nuclei) may function generatively.

A new genus of the Plasmodiophoraceae, J. N. Couch, J. Leitner, and A. Whiffen (*Jour. Elisha Mitchell Sci. Soc., 55 (1939), No. 2, pp. 399–408, pls. 2*).—*Octomyxa achlyae* n. g. and sp. is described as an obligate parasite on the hyphae of *Achlya glomerata*, causing gall-like swelling on the hyphal tips.

A microscopical study of the mycelium of Stereum gausapatum Fries, J. A. Herrick (*Amer. Micros. Soc. Trans., 58 (1939), No. 4, pp. 377–384, figs. 31*).—Mycelia of 36 single-spore and 21 other isolates of *S. gausapatum* were studied microscopically, and the morphological and cytological results are described in detail. No spores of any kind were found in culture. In view of the similarity between the single-spore and other mycelia, together with accepted principles in mycology, it is tentatively concluded that this fungus is homothallic.

Handbook of phytopathogenic viruses, F. O. Holmes (*Minneapolis, Minn.: Burgess Pub. Co., [1939], pp. VII+221*).—Realizing the need in this constantly changing field for a system of classification capable of clearly indicating present conceptions yet sufficiently flexible to permit easy assimilation of changes as new evidence becomes available, the author presents a system resembling that commonly used for the higher biological forms. This system is an amplification of one previously proposed (E. S. R., 81, p. 222), and it is believed will tend to display rather than conceal demonstrated relationships among the plant viruses. The Latin binomials here used are all new names, and are accompanied by descriptions of viruses to which they are intended to apply. Appropriate common names are also given, and other names that have been applied to each virus are listed as synonyms. Since new viruses are constantly being discovered, it may be that some of the 129 viruses here treated as separate entities will on further study prove to be identical or closely related. However, it is hoped that the simplicity of their treatment may facilitate examination and comparison and provide for ready reference to the many details that have been reported regarding each virus. The monograph is concerned primarily with the viruses of seed plants, the bacteriophages being treated in a supplement. Other supplements consider lists of susceptible and insusceptible plants and of viruses not treated in this handbook. A tabulation of the 10 families and their included genera and a subject index are provided.

Ultraviolet absorption spectra of latent mosaic and ring spot viruses and of their nucleic acid and protein components, G. I. Lavin, H. S. Loring, and W. M. Stanley (*Jour. Biol. Chem., 130 (1939), No. 1, pp. 259–268, figs. 8*).—The ultraviolet spectra of these viruses and of their nucleic acid and protein components were determined. The absorption maximum of latent mosaic virus (like that of tobacco mosaic virus) was at ±2,650 a. u., while that of ring spot virus was at ±2,600 a. u. Ring spot virus, however, absorbed much

more strongly than any of the other viruses, probably due to its unusually high nucleic acid content. The nucleic acids from the three viruses showed absorption maxima at ±2,600 a. u., and were comparable in this respect to those from yeast and pneumococci. The protein components were like other simple proteins in having absorption maxima at ±2,800 a. u. When the respective nucleic acids and proteins were mixed, the absorption curves approached those for the original viruses, though in each case there were differences. The detailed band structures of the various preparations as obtained with a continuous light source are presented. The different viruses and their respective protein components showed characteristic structures. The three nucleic acid components showed only a broad band of absorption at ±2,600 a. u. The spectrum of tobacco mosaic virus inactivated by formaldehyde or H_2O_2 was like that of active virus, whereas that of virus inactivated by HNO_2 had its most intense band in a different region of the spectrum.

Efficient spacing of soil fumigants for field applications, A. L. Taylor. (U. S. D. A.). (*Helminthol. Soc. Wash. Proc., 6 (1939), No. 2, pp. 62–66, fig. 1*).—It is concluded that if k is the maximum distance from the point of application of a soil fumigant to the point where it produces the desired results, the most efficient utilization of the fumigant is obtained when the application points are located in straight parallel rows 1.5 k apart and 1.732 k apart in the rows. The first application point in the first and other odd-numbered rows is located on a line perpendicular to the rows, and the first application point in the second and other even-numbered rows is made at a distance 0.866 k from this line. Under the above condition each application will fumigate an area 2.598 k^2. From the number of applications required for a given area, the number of units per application, and the units per pound or kilogram of the fumigant, the total weight required for the area can be easily calculated. Examples are given, and tabulated spacing and amounts are shown.

Frames for spacing injections of soil nematocides, B. G. Chitwood. (U. S. D. A.). (*Helminthol. Soc. Wash. Proc., 6 (1939), No. 2, pp. 70–73, figs. 2*).—Several types of frames, based on the formulas of Taylor (noted above) have been designed and are here described and illustrated.

Some factors governing the success of chemical treatment of soil for nematode control, G. Thorne. (U. S. D. A.). (*Helminthol. Soc. Wash. Proc., 6 (1939), No. 2, pp. 60–62, fig. 1*).—This detailed experiment on the distribution of the nematode population (in this case *Heterodera schachtii*), the soil structure and moisture content, and the actual penetration of the chemical applied (granular calcium cyanide) is believed to indicate why such powerful poisons have failed to give complete control even when applied in amounts far too expensive for commercial use. Penetration by gases through the plow sole and underlying subsoil is very difficult, yet an important part of the nematode population is shown to be present in such areas. Applications of $Ca(CN)_2$ were also made at a depth of 14–16 in., using a subsoil plow attachment, but a large number of the nematodes still escaped in the hard, unbroken soil. *H. schachtii* is an unusually favorable species on which to make population studies, for in spring all larvae are in the eggs within brown cysts which are easily separated from the soil. Free-living nematode species are always present in any cultivated soil, and these may be used as indicators of what a chemical treatment has accomplished.

A rapid method for determining k values of nematocides, B. G. Chitwood. (U. S. D. A.). (*Helminthol. Soc. Wash. Proc., 6 (1939), No. 2, pp. 66–70, fig. 1*).—"Technics for determining the killing range of a nematocide are discussed. The I-type test (horizontal) is considered of value in selecting chemicals and determining dosage rates but not for the determination of row and hole spacing in

plat or field. After selecting a few promising dosage rates, X- or Y-type tests should be performed using various arm lengths and including a vertical arm. Information so obtained should be applied only under conditions similar to those of the test."

Ecological specialization in the stem-and-bulb-infesting nematode, Ditylenchus dipsaci var. amsinckiae, G. H. Godfrey. (Tex. Expt. Sta.). (*Phytopathology, 30 (1940), No. 1, pp. 41-53, figs. 6*).—The plant-infesting nematode *D. dipsaci amsinckiae*, in its manner of producing galls in its host plant, *Amsinckia intermedia*, was found to display a remarkable specialization in the selection of tissues invaded, differing markedly in this respect from other strains of *D. dipsaci*. Primary infestation occurs among the leaves around the growing point, whence it enters the developing flowers. Entrance is gained by migration between the floral parts to the space adjacent to the ovary, where the nematodes stimulate hyperplastic growth of the floral parts, resulting in complete enclosure of the parasites and formation of a gall much larger than the normal fruit. The nematodes here feed and pass through two complete life cycles eventuating in a tremendous population (up to 40,000 in a single gall) of sexually differentiated resting-stage larvae. The galls fall to the ground, thus limiting dissemination of the parasite to a narrow zone. This manifestation of specialized host-parasite ecological relationship is compared with that of a strain of the same nematode species in *Hypochaeris radicata*.

Studies on physiologic specialization of the organisms causing bunt in wheat, and the genetics of resistance to this and certain other wheat diseases, I, II, J. G. Churchward. (Univ. Minn. et al.). (*Roy. Soc. N. S. Wales, Jour. and Proc., 71 (1937-38), pt. 2, pp. 362-384, figs. 3; pp. 547-590, pls. 2, figs. 3*).—Two papers are presented.

I. *Physiologic specialization studies*.—Collections from widely separated centers in all the Australian wheat areas tested over 3 yr. yielded three physiologic races of *Tilletia tritici* and four of *T. levis*, demonstrated for the first time in Australia by pathogenic tests. No difference in size of chlamydospores in collections of the two species were noted, nor in size, shape, or consistency of bunt balls or in cultural growth on media of the various races. The investigations were continued two further seasons, using a large number of races, these additional results indicating that some collections maintain a constant pathogenicity over a period of years, while others do not. Four of the known Australian races corresponded with others determined elsewhere. There are 43 references.

II. *Genetical studies*.—In a wheat cross (Federation × Hope), field and greenhouse studies were made at Richmond, New South Wales, and University Farm, St. Paul, Minn., on the inheritance of resistance to bunt (*T. tritici*), flag smut (*Urocystis tritici*), and two races of stem rust (*Puccinia graminis tritici*), and on certain morphological characters. With respect to *T. tritici*, the field results indicated that, besides a single factor for resistance, there are one or more modifiers acting in this cross, allowing a small amount of bunt in resistant lines. Resistance to stem rust (race 34) in the field was determined by at least two factors and probably several other important modifying factors. Single factors, inherited independently of those for resistance in the field, determined resistance of races 33 and 34 in the greenhouse. The reactions of F_3 lines in the greenhouse to *U. tritici* indicated the operation of a single factor for resistance. In this cross, the varieties showed a single factor difference for growth habit and time of emergence of the first leaf. Two factors operate for coleoptile and stalk color and expression of awnedness, while three determine the mode of inheritance of grain color. A strong linkage of genes deter-

mining stalk and coleoptile color was noted, and there were also indications of loose linkage between genes for resistance to bunt and flag smut, resistance to race 34 of stem rust in the field and maturity, and resistance in the greenhouse to races 33 and 34 of stem rust. The present position regarding the genetics of bunt is discussed and observations are made on the adoption of criteria in plant genetics studies, the importance of the environal factors, and the need for standardization of conditions under which studies are carried out. There are 72 references.

Anatomical and cytological modifications in cereals attacked by mosaic virus, V. ZAZHURILO and P. SCHWARTZ (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 24 (1939), No. 2, pp. 185–188, figs. 4*).—Mosaic diseases of cereals occurring in the Voronezh Province, U. S. S. R., were found to be characterized by morphological and cytological modifications typical of plant (especially cereal) virus diseases, viz, phloem necrosis, underdeveloped plastids, nuclear hypertrophy attended with vacuolization, increased number of nucleoli, and formation of vacuolar bodies and protein crystals. The presence of protein crystals in oats, millet, and maize with green mosaic and in rosettes of winter wheat is considered good ground for supposing that these two mosaics as they occur in this province are induced by the same virus as that responsible for the "zakuklivanie" of oats in Siberia and in the northeastern regions of Europe.

Darluca filum (Cast.) in the control of rust [trans. title], N. S. FEDORINCHIK (*Inst. Zashch. Rast., Zashch. Rast. (Lenin Acad. Agr. Sci., Inst. Plant Protect., Plant Protect.), No. 18 (1939), pp. 61–70, figs. 5; Eng. abs., pp. 69, 70*).—In tests with *D. filum* on wheat plants infected with *Puccinia triticina*, with a view to possible biological control, this secondary parasite developed well on the uredo and teleuto stages and on the mycelium of the rust fungus, germination occurring in 3 hr. at 15°–25° C. under high humidity with the optimum at 20°–21°. The incubation period varied from 4 to 7 days within the temperature limits of 9°–30°. On transfer from *P. triticina* to *P. dispersa*, *P. graminis*, *P. coronifera*, or *P. simplex*, the parasite continued to develop as well as on its original host. Under field conditions the development of *D. filum* was most intense in spring and fall, under maximum moisture conditions. It has been grown in pure culture up to the pycnidial stage.

Investigations of physiological specialization in stem rust of wheat and oats in Germany, 1937 [trans. title], K. HASSEBRAUK (*Arb. Biol. Reichsanst. Land u. Forstw., 22 (1939), No. 4, pp. 479–482*).—From 28 sources of *Puccinia graminis tritici* in southern Germany, the author reports physiologic races 2, 14, 21, 23, 24, 27, 40, and 133, together with 3 new races designated E, F, and G, and from 13 similar sources of *P. graminis avenae*, races 1, 2, 4, 6, and 8, together with the new races 1a and 11. The results indicate a different composition of the race flora from that for 1934–35.

The spectral sensitivity of spores and sporidia of Ustilago zeae to monochromatic ultraviolet light, E. W. LANDEN. (Univ. Mo.). (*Jour. Cell. and Compar. Physiol., 14 (1939), No. 2, pp. 217–226, figs. 4*).—Ultraviolet irradiation caused a retardation of germination and subsequent growth of both spores and sporidia. For 50 percent lethality a broad minimum value in incident energy occurred (with energy plotted against wavelength) in the vicinity of 2,650 a. u. for both spores and sporidia, maximum values being found at wavelength 2,400 a. u. Below the latter point the incident energy to kill 50 percent of the spores decreased slightly, while that for equivalent killing of the sporidia decreased more rapidly. Wavelength 3,022 a. u. killed both spores and sporidia, but at 3,130 a. u. a dose of 1,500,000 e./mm.^{2} failed to kill. Sporidia were more susceptible than spores to irradiation by any one wavelength. Using 50 percent killing

as a criterion, the ratio of the energies for killing spores and sporidia varied irregularly within the limits of 3.8 at 3,022 a. u. and 34 at 2,300 a. u. The absorption of sporidial films was measured. At wavelengths showing small absorption a high incident dosage must be applied to produce lethal effects, and vice versa.

Further studies on oat blast, R. A. DERICK and D. G. HAMILTON (*Sci. Agr., 20 (1939), No. 3, pp. 157-165*).—Since publication of the preliminary paper in 1935 (E. S. R., 74, p. 793), study of this disease has been continued, with the following conclusions: The actual losses involved bear a direct relation to the amount of blast. No statistical relation was found between number of blasted spikelets and total number of spikelets (fertile and infertile) except for the variety Eagle, the correlation here being negative and significant. A high positive correlation existed between total number of spikelets and yield. It is shown by partial correlation that there is a strong negative correlation between number of blasted spikelets and yield. Multiple correlation coefficients indicated that both total number of spikelets and number of blasted spikelets have a marked effect on yield. Use of the multiple regression equation indicated a negative relationship, independent of other characters, between yield and number of blasted spikelets and a positive independent relationship between total number of spikelets and yield. Besides the loss of spikelets and the consequent lower yield due to blast, there was an indication that the physiological conditions associated with the causes of blast may adversely affect the maximum development of the remaining fertile spikelets. Regardless of environment and maturity, oat varieties are said to possess different degrees of resistance to blast, and from the data obtained it would appear that degrees of resistance or susceptibility are controlled by genetic factors. With similar amounts of blast, it appears that the yield of one variety may not be as adversely affected as that of another.

Bean-mosaic (Phaseolus virus 1 of Smith, 1937), E. E. CHAMBERLAIN (*New Zeal. Jour. Sci. and Technol., 20 (1939), No. 6A, pp. 381A-388A, figs. 4*).—Bean mosaic is said to be distributed throughout New Zealand, occurring on both French and runner beans and shown to be transmitted through the seed as well as by artificial inoculation. Attempts to transmit the disease to legumes outside the genus *Phaseolus* have failed. Production of mosaic-free lines and breeding of resistant varieties are recommended control measures.

Brown blight of lettuce, I. C. JAGGER. (U. S. D. A.). (*Phytopathology, 30 (1940), No. 1, pp. 53-64, figs. 5*).—In this posthumous publication from a manuscript of the late author, brown blight, known to affect only lettuce, is reported to have caused increasing losses in the Imperial Valley, Calif., and in parts of Arizona. At the 4- or 5-leaf stage yellow spots develop, the plants later becoming yellow, stunted, and rosettelike and finally turning brown and dying. The disease is soil-borne, but is not due to alkali poisoning. Sterilization of the soil by steam or formaldehyde destroyed the infective agent. The causal entity was believed to be either a virus, similar to the soil-borne mosaic of wheat, or a fungus. Crop rotation proved ineffective in its control. Observations indicated the inadvisability of growing susceptible lettuce varieties on land where a crop has shown 1 percent or more of infection. Since the Big Boston and Chavigne varieties appeared immune, crosses were made with the susceptible New York variety commonly grown in the Imperial Valley up to 1927. Trials with the F_2 progenies indicated resistance to be controlled by a single dominant Mendelian factor. Resistant selections within the New York variety were also made. After all but three parent plants from the last group were eliminated, strains 1 and 3 were shown to be of doubtful commercial

importance, while strain 2 gave promise of being satisfactory in the Imperial Valley. This selection was released to seed companies in 1926 as Imperial No. 2.

Breeding for resistance to onion downy mildew caused by Peronospora destructor, H. A. JONES, D. R. PORTER, and L. D. LEACH. (Coop. U. S. D. A.). (*Hilgardia [California Sta.], 12 (1939), No. 9, pp. 531–550, figs. 6*).—Since adequate control measures are still lacking and the disease often appears in epidemic form, heavy losses are frequently encountered. Actual losses by seed growers in California are said to vary from 0 to 80 percent, with the weather as the main conditioning factor. During 6 of the past 19 yr. the annual reduction in seed yield is reported to have been 10 percent or higher, with a maximum of 60–80 percent in 1925. The most promising method of control lies in the development of resistant varieties, three sources for which have been found. Thus far the best one is a male-sterile selection from the Italian Red variety, the seedstalks of which are immune and the leaves highly resistant. Another strain of this variety, better in type, has seedstalk immunity but the foliage is only slightly resistant. Seedstalk immunity also appeared in an F_1 hybrid between Red 21 and two inbred lines of Stockton Yellow Flat. Measured evidence of varietal and hybrid resistance is indicated in tabular form and discussed in the text. Certain F_3 and backcross populations are noted as particularly promising.

Pea-streak (Pisum virus 3), E. E. CHAMBERLAIN (*New Zeal. Jour. Sci. and Technol., 20 (1939), No. 6A, pp. 365A–381A, figs. 7*).—Pea streak, an apparently unrecorded virus disease of garden peas, is described and the name *Pisum* virus 3 proposed for it. The symptoms consist of streaking of stems and pods, spotting and wilting of leaves, and finally death of the plants. It has been found spontaneous only on this host and in the vicinity of Palmerston North, New Zealand. The virus was readily transmitted by inoculation, but attempts at insect transfer have thus far failed. Of 52 plant species (30 genera and 9 families) tested, 19 species in 10 genera of the Leguminosae and Cucurbitaceae proved susceptible. Of 35 garden pea varieties tested, 6 exhibited a high degree of resistance. The properties of the virus are described, and suggested control measures are given.

Relation of temperature and moisture to near-wilt of pea, W. J. VIRGIN and J. C. WALKER. (Wis. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 59 (1939), No. 8, pp. 591–600, figs. 2*).—Investigations of temperature effects on the radial expansion of the near-wilt fungus (*Fusarium oxysporum* f. 8) on potato-dextrose agar indicated growth to occur at 8°–36° C., with most rapid growth at 28°. Near-wilt developed more slowly in a favorable environment than did wilt (*F. orthoceras pisi*), and its course was slower in late- than in early-blossoming pea varieties. The optimum soil temperature for near-wilt was ±24°–28°, i. e., ±5° higher than for wilt. The former developed readily, however, at as low as 20°, while at 16° it was distinctly retarded. Air temperature had relatively little influence on the disease. In susceptible varieties there was little difference in the rate of wilting in dry v. medium-moist soil, but it was consistently more rapid in moist soil. In the resistant varieties tested, wilting was most rapid in medium-moist soil, but the rate in all soils was sufficiently rapid to indicate little retardation of the disease in dry seasons.

Effect of moisture, fertility, and fertilizer placement on root rot of canning peas in Wisconsin, J. C. WALKER and F. L. MUSBACH. (Wis. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 59 (1939), No. 8, pp. 579–590, figs. 5*).—In a study of the effects of fertilizer treatments on the severity of rot due to *Aphanomyces euteiches* in Colby silt loam, greenhouse tests with several varieties of canning

peas exhibited marked control in three successive crops grown on soil treated once with 4-16-4 fertilizer at 500 lb. per acre. In field tests on five soil types in five Wisconsin locations the comparative productiveness of peas and the relative severity of root rot under differing fertilizer placements was studied. In noninfested soils with 200 and 300 lb. per acre the highest yields, averaging 13.7-22.2 percent above the untreated controls, were obtained with the fertilizer applied down the same drill spout with the seed. When applied ±1.5 in. to the side of and at the same level as the seed the increases averaged less than 10 percent. In general, the same relative results were obtained in infested soil, with the further important result that the percentages of increased yield were much greater. The differences in the plats with fertilizer placed at the side of the seed varied from a decrease of 14 percent to an increase of 68 percent over the control, whereas with the fertilizer applied with the seed the increases were 46-248 percent. Apparently the rapidly available nutrients placed in amounts of 200-300 lb. per acre in the furrow with the seed made it possible for the plants to develop greater resistance to root rot. Furthermore, much greater reductions in root rot and increases in yield were obtained when 2 percent of readily available nitrogen was included in the fertilizer than when it was omitted.

Report on potato virus diseases in 1938, T. P. DYKSTRA. (U. S. D. A.). (*Amer. Potato Jour., 16 (1939), No. 8, pp. 204-212*).—This report reviews some of the papers on various phases of potato virus investigations published in late 1937 and in 1938. There are 26 literature references.

Blight immune versus blight resistant potatoes, D. REDDICK and W. R. MILLS. (Cornell Univ.). (*Amer. Potato Jour., 16 (1939), No. 8, pp. 220-224*).—Certain hybrid seedling potatoes are found immune to late blight when *Phytophthora infestans* for inoculation is taken from commercial varieties but are susceptible to infection by a virulent culture of the organism. Tests were made to determine whether a build-up in virulence might be expected under average field conditions or whether certain of these hybrids might well be introduced as blight-immune. In four of the five tests made the hybrids known to be susceptible to infection by the virulent culture eventually became affected. On the basis of the assumption that the fungus would overwinter at the virulent level and would thus be in condition to initiate general infection, it is concluded that for the present it is highly inadvisable to allow any such hybrids to exist outside of experimental fields.

Contribution to the study of virus diseases of spinach [trans. title], G. ROLAND (*Tijdschr. Plantenziekten, 45 (1939), No. 6, pp. 260-274; Fr. abs., pp. 272, 273, pls. 2*).—From this study of a serious yellowing and death of a high percentage of spinach observed in the regions of Maastricht and 's Gravenhage, Netherlands, the author concludes that two viruses have been involved, viz, sugar beet mosaic ("vergelingsziekte"), transmissible only by aphids, and spinach mosaic ("mozaiekziekte"), transmissible by both infected juice and aphids. The symptoms on spinach in the field, and those in the greenhouse on spinach, beets, cucumber, tobacco, and *Nicotiana glutinosa* are described, and comparisons with the literature (15 references) are made.

Experimental production of blackfire on tobacco, E. M. JOHNSON, S. DIACHUN, and W. D. VALLEAU. (Ky. Expt. Sta.). (*Phytopathology, 30 (1940), No. 1, pp. 73-79, figs. 3*).—Large zonate spots resembling those in spontaneous epidemics of blackfire were produced on topped Burley and dark tobacco in infertile fields by atomizing leaves with *Bacterium tabacum* or *B. angulatum*. Dew usually covered the leaves in the morning. Similar spots were induced by inoculations in the greenhouse where the plants were kept nightly in an artificial

fog. Both in field and greenhouse the spots increased in size during the night, when a wet, necrotic, advancing border was formed that became dry and brown during the day. Watersoaking thus appears unnecessary for production of blackfire spots. This is believed to be the first report of zonate blackfire spots induced by pure culture inoculations and under controlled conditions.

Properties and hydrolytic products of nucleic acid from tobacco mosaic virus, H. S. Loring (*Jour. Biol. Chem., 130 (1939), No. 1, pp. 251–258*).—Since 90 percent of the phosphorus in purified tobacco mosaic virus was isolated as nucleic acid, it is deemed probable that all of the virus P is thus combined. The general properties and chemical analyses of the virus nucleic acid are said to be comparable to those of other ribonucleic acids. The purines, guanine and adenine, the pyrimidine, cytosine, and the brucine salt of a compound with the N and P content of the brucine salt of yeast uridylic acid were isolated from its hydrolytic products. However, the optical activity and solubility of this brucine salt as compared with that of yeast uridylic acid indicated that the two are isomeric rather than identical. These studies therefore provide evidence for the presence of a new pyrimidine nucleotide in a pentose nucleic acid.

A method for testing resistance of tomatoes in Fusarium wilt, A. L. Harrison. (Tex. Expt. Sta.). (*Phytopathology, 30 (1940), No. 1, pp. 86, 87, fig. 1*).—Young plants were inoculated with *F. bulbigenum lycopersici* by immersing the roots in 4- to 7-day-old liquid nutrient cultures prior to transplanting in trays or cold frames. The varietal ratings for resistance were comparable to those from setting young plants in wilt-sick fields. This technic is proposed as an aid to the development of wilt-resistant tomatoes and to the study of other tomato-wilt problems.

Essar—a new Verticillium wilt resistant canning tomato, M. Shapovalov and B. A. Rudolph. (U. S. D. A. and Univ. Calif.). (*Seed World, 48 (1939), No. 13, pp. 12, 13, figs. 4*).—As a result of several years' work this new variety, said to be superior in resistance to *V. alboatrum* wilt and in horticultural characteristics to the heretofore commonly planted Early Santa Clara Canner, is now reported available for growers. It is here briefly described and illustrated. Essar requires the best cultural conditions and is not resistant to the virus-induced spotted wilt.

Occurrence and longevity of Ascochyta pisi in seeds of hairy vetch, W. Crosier. (N. Y. State Expt. Sta.). (*Jour. Agr. Res. [U. S.], 59 (1939), No. 9, pp. 683–697, figs. 4*).—As tested in 1934, *A. pisi* was demonstrated in only one of 181 lots of hairy vetch (*Vicia villosa*) seed imported in 1929-30 and in 16 of 110 lots imported in 1931-32. Of a total of 224 samples representative of both domestic and foreign crops of 1931-37, tested immediately on receipt, 149 were internally infected, but during storage in a warm, dry laboratory for 1–5 yr. the number of *A. pisi*-seed associations decreased continuously, though the viability of the seed remained nearly constant for 4 yr. or more, thus suggesting prolonged storage as a means of control. The longevity of the parasite was not correlated with hard-shelled seed. A definite relation was found between infection in pods and seeds. The fungus was usually resident immediately inside the seed coats, but also occurred in all parts of severely infected seeds. Both spores and mycelia were less affected by hot air or water than were the vetch seeds. The fungus content of seed stocks treated with New Ceresan decreased significantly during 2 yr. of storage, but other chemicals used were ineffective in eliminating internal fungi. *Alternaria* sp., *Fusarium* spp., *Rhizoctonia solani*, and *Xylaria* sp. were isolated infrequently from hairy vetch seeds. *Ascochyta pisi* was found in seeds of various species of *Vicia* but not in those of *V. sativa*.

Comparative study of the apple anthracnose and perennial canker fungi, J. R. KIENHOLZ. (U. S. D. A.). (*Jour. Agr. Res.* [U. S.], *59* (*1939*), *No. 9, pp. 635–665, figs. 10*).—Apple anthracnose (*Neofabraea malicorticis*) and perennial canker (*Gloeosporium perennans*) are said to be very closely related. Though the pathological differences are quite distinct, the fungi could not be differentiated by morphological, physiological, or mycological criteria. Anthracnose occurs mainly in the coastal and perennial canker in more arid regions, but both forms occur in certain overlapping areas where the causal fungi tend to an intermediate type, making identification from conidial characters difficult. In these overlapping districts the conidia produced by either fungus in cultures or on apple fruits were of perennial-canker type. No method of separating the species by laboratory means was found. Both fungi frequently produced sectors in culture. Conidia typical of the perennial canker and intermediate forms were produced by inoculating mutants from anthracnose cultures, these findings suggesting that the two forms may have arisen by mutation from a single species. The apothecial stage of *G. perennans* is described and compared with *N. malicorticis*. While minor variations were found, the perennial-canker fungus is retained as a distinct species because of its pathological differences and is named *N. perennans* n. comb. There are 42 literature references.

Controlling fire blight of apples and pears, H. W. RANKIN and A. H. BAUER (*Pa. State Col. Ext. Cir. 214* (*1939*), *pp.* [2]+6, *figs. 3*).—An informational circular.

Unusual bacterial spot symptoms on peach leaves, J. C. DUNEGAN. (U. S. D. A. and Ark. Ext. Sta.). (*Phytopathology, 30* (*1940*), *No. 1, pp. 88, 89, fig. 1*).—Atypical symptoms of *Bacterium pruni* spot were noted on leaves of an 18-month-old Elberta peach orchard in Arkansas (June 1, 1939). Instead of culminating in the typical shot-hole effect, the organism had invaded large areas of the leaves and produced infiltrated, translucent regions where the cellular structure was completely disorganized. Pure cultures of *B. pruni* were secured from such areas. These symptoms were much more pronounced in a part of the 20-acre block where string beans had been interplanted in 1938.

A blight of wild cherry seedlings, J. C. DUNEGAN. (U. S. D. A. and Ark. Expt. Sta.). (*Phytopathology, 30* (*1940*), *No. 1, pp. 89, 90, fig. 1*).—A blight of *Prunus serotina* seedlings due to *Sclerotinia seaveri* has been under observation since 1924, the disease appearing about the time the second pair of true leaves unfolds in spring. A brown, water-soaked region forms at first near the apex of the stem, and infected seedlings develop a characteristic drooping of the stem through loss of turgor. The fungus moves down the stem, involving the leaves, and when it reaches the ground line the tree dies. The disease occurs in Georgia and Arkansas and must be considered as a factor limiting the reproduction of *P. serotina* in the South.

Some mosaic diseases of Prunus species, H. EARL THOMAS and T. E. RAWLINS. (*Hilgardia* [*California Sta.*], *12* (*1939*), *No. 10, pp. 623–644, figs. 10*).—One or more mosaic-type diseases have been reported for central California as affecting *P. armeniaca*, *P. avium*, *P. cerasifera*, *P. cerasus*, *P.* (=*Amygdalus*) *communis*, *P. domestica*, *P. mahaleb*, *P.* (=*Amygdalus*) *persica*, and *P. salicina*. These vary from mild to severe on the known hosts, and their symptoms are described and illustrated. Cherry mosaic 1 of *P. avium* is rather widely distributed in the State and was found transmissible to *P. persica* and apparently to other species. Almond calico proved transmissible to *P. avium* and *P. persica*, with rather pronounced symptoms on the cherry. At least two mosaics were found in the Japanese plum (*P. salicina*), one of

which (Vacaville plum mosaic) on the Santa Rosa variety was transferred to peach seedlings. Mosaics of Standard and Sugar prune (*P. domestica*) are similar in certain symptoms, but present evidence indicates them to be distinct. The first was transmitted to peach. A mosaic of *P. persica*, thus far known in only one locality and designated "Winters peach mosaic," in many respects resembles mosaic of peaches in Texas, southern California, and elsewhere. It occurs spontaneously on peach, apricot, and probably on almond, and has been transmitted by grafting to *P. andersonii*, *P. armeniaca*, *P. avium*, *P. communis*, *P. mume*, *Kerria japonica*, and *Rosa* sp. An attempt to immunize peach seedlings against the Winters disease by using several milder mosaic viruses proved unsuccessful.

Observations on the behavior of perithecia of powdery mildew of grapes [trans. title], R. SEELIGER (*Arb. Biol. Reichsanst. Land u. Forstw., 22 (1939), No. 4, pp. 453–478, figs. 2*).—The factors influencing oidial and perithecial attack by *Uncinula necator* are discussed. All grape varieties observed are said to have proved susceptible to attack by the *Oidium* stage, infection among them varying from very light to very severe. In different places perithecial development differed markedly in spite of comparable infection by the fungus. Since observations indicated that on vines with a similar amount of infection the fungus tends to develop comparable numbers of perithecia when no other internal or external influences are operating, it follows that in some cases perithecial development is more or less distinctly inhibited. This inhibition is believed related rather to differences in the stand than in the variety. For example, on well-exposed vines, in contrast to poorly lighted ones, perithecial development was not favored. A definite correlation of severity of attack with abundance of perithecial development was observed. There was a similar correlation with the first appearance of the fungus on the individual vines, this being related to the fact that susceptible varieties as a rule are also attacked early. No correlation was found of the differences in time of autumnal coloring and leaf fall among the grape varieties with the formation of perithecia, or of the osmotic values of the leaves with their attack by mildew or the time of appearance and numbers of perithecia developed. However, the fungus was sometimes apparently less inclined to develop perithecia on some varieties than on others, independently of their susceptibility to infection. There are about two pages of references.

Rind structure and composition in water spot of navel orange, L. J. KLOTZ and F. M. TURRELL. (Calif. Citrus Expt. Sta.). (*Calif. Citrog., 25 (1939), No. 2, pp. 45, 56, 57, figs. 5*).—From a brief review of the literature and the results of studies here described, it is concluded that the capillary, spongelike structure of the rind and the hydrophilic and osmotic properties of the cells are important factors in the development of water spot. The internal liberation of toxic rind oil and decay by blue and green molds are important secondary factors in the ultimate break-down of the fruit. The incidence of water spot is not correlated with density of oil glands or of stomata in the orange rind. This is said to agree with previous work and observations indicating that growth cracks and fresh mechanical and chemical injuries are the most efficient avenues for the absorption of external water.

Suggestions for the identification and control of azalea flower spot, F. WEISS. (U. S. D. A.). (*Subtrop. Gard., 2 (1939), No. 1, pp. 6, 20, 22*).—The data here reported have been referred to (E. S. R., 81, p. 232).

Aphid transmission of the virus causing white streak of narcissus, F. S. BLANTON. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 5, pp. 726, 727*).—

Illinoia solanifolii (potato aphid) and *Aphis rumicis* (bean aphid) are reported to have been proved vectors of this virus.

Mosaic diseases of the rose in California, H. EARL THOMAS and L. M. MASSEY (*Hilgardia [California Sta.], 12 (1939), No. 10, pp. 645–663, figs. 6*).—Three distinct mosaics of roses found in California were designated, respectively, as rose mosaics 1, 2, and 3, and methods for differentiating them are presented. In addition, roses were successfully inoculated with apple mosaic virus and with the virus of a peach disease designated as "Winters peach mosaic." Use of buds from affected plants appears to be an important means of introducing these rose diseases. The virus of rose mosaic virus 1 survived heat treatments near the limit of tolerance for the rose cuttings, and virus 2 withstood exposure to 30° C. for 11 days. There are 18 literature references.

A rot of Scilla bulbs caused by Penicillium cyclopium Westling, C. S. MACFARLANE (*Bot. Soc. Edinb., Trans. and Proc., 32 (1938–39), pt. 4, pp. 542–547*).—This storage rot of Spanish squill was found due to *P. cyclopium*. Infection tests on *S. campanulata* (=*hispanica*) and *S. nutans* (=*nonscripta*) showed that injury and an external source of moisture are required for infection. High temperatures and contact between the bulbs favored its spread.

Breeding trees for disease resistance, A. H. GRAVES (*East. Shade Tree Conf., New York, 1938, Proc., pp. 95–99*).—The author presents evidence for the hybrid nature of the London plane tree (*Platanus acerifolia*), noting the recently reported *Ceratostomella* disease attacking it, and refers to progress at the Brooklyn Botanic Garden in developing chestnuts resistant to the blight and to European work directed toward selection for resistance to the Dutch elm disease.

The Strumella disease of hardwoods (Strumella coryneoidea Sacc. and Wint.), C. B. BIDWELL (*Mass. Forest and Park Assoc. Tree Pest Leaflet 32 (1939), pp. [4], figs. 4*).—An informational contribution.

Relation of wounds to infection of American elm by Ceratostomella ulmi, and the occurrence of spores in rainwater, L. J. TYLER, K. G. PARKER, and S. POPE (Cornell Univ.). (*Phytopathology, 30 (1940), No. 1, pp. 29–41*).—Field observations indicated that coremia of *C. ulmi* may develop in somewhat exposed places on infected field and planted elms and on apparently uninfected decadent trees. Rain water collected from trunk surfaces of diseased field elms selected at random sometimes yielded *C. ulmi* spores. Using 3- to 4-year-old potted American elms, infection followed introduction of spores into fresh wounds of many kinds and on different parts of the tree which reached and penetrated xylem elements. Application of spores to intact cortical surfaces or to cortical wounds not reaching the wood gave negative results. Root, trunk, and branch wounds up to 2 weeks old readily admitted the fungus, but 1-month-old wounds were less favorable. Invasion of trees was more extensive and destructive after inoculation during their period of rapid growth than at other times. The incidence of infection was greater in trees inoculated and held under high moisture conditions than in similarly inoculated trees held under drier conditions.

Daedalea unicolor decay and associated cankers of maples and other hardwoods, W. A. CAMPBELL (U. S. D. A. et al.). (*Jour. Forestry, 37 (1939), No. 12, pp. 974–977, fig. 1*).—In the Green Mountain National Forest, Vermont, *D. unicolor* was found associated with decay and cankers of living sugar maple and red maple, being especially common on trees of sprout origin. It was also noted to a lesser extent on paper birch and yellow birch and was

collected once on American elm. The fungus appears important as an eliminator of sprout clumps, especially in second-growth maple stands, but it does not confine itself to poor trees which have no promise for timber. From the timber stand improvement angle, therefore, no sprout stem in a clump with *D. unicolor* on any of the companion stems should be considered as a potential crop tree.

A vascular wilt of the mimosa tree (Albizzia julibrissin), G. H. HEPTING (*U. S. Dept. Agr. Cir. 535 (1939), pp. 11, figs. 2*).—The principal symptoms of this highly destructive disease appearing within the past few years in the southeastern United States are wilting followed by death of the foliage and a brown ring of discolored sapwood, usually in the current annual ring of the stem and branches. What appear to be two forms of a *Fusarium* (section Elegans) were isolated consistently from the discolored sapwood. Inoculations with these two forms were successful, and the form most commonly isolated is described as *F. perniciosum* n. sp. The disease was observed in trees growing on soils ranging from sand to clay, from acid to alkaline, and from near sea level to 2,200 ft. elevation. The present known range is from Richmond, Va., to La Grange, Ga., in the Piedmont and Coastal Plain regions.

Diseases of ornamental oaks in Illinois, J. C. CARTER (*Arborist's News, 4 (1939), No. 12, pp. 89–96, figs. 2*).—An informational contribution.

The development of blister rust on young planted northern white pine, R. R. HIRT. (U. S. D. A. et al.). (*Jour. Forestry, 37 (1939), No. 12, pp. 967–969, fig. 1*).—In six plantations it was found that a single exposure of young white pine to telium-bearing leaves of European black currants for 12 or 24 hr. resulted in 4 percent while continuous exposure resulted in 69 percent of the trees becoming infected. Within 5 yr. after infection, ±33 percent of the diseased trees had died. It is said that eventually a plantation will free itself of blister rust, largely through the death of infected trees, if it is sufficiently well protected from subsequent attack. However, the number of trees surviving will depend to a great extent on the number free from the rust at the time protective measures are initiated. The plantations used in this study were protected from spontaneous infection with *Cronartium ribicola* by eradicating *Ribes* within 900 ft. of the borders, this method, within 5-yr. periods, permitting only 0.5 percent infection.

Time of growth of Cronartium ribicola cankers on Pinus monticola at Rhododendron, Oregon, J. W. KIMMEY. (U. S. D. A.). (*Phytopathology, 30 (1940), No. 1, pp. 80–85, figs. 2*).—A total of 117 white pine blister rust cankers on 19 western white pine trees were used in studying the seasonal fluctuations in canker growth rate (1934–35 and 1936–37). Great differences in time of growth (curves shown) were found among cankers and to a lesser extent between the two ends of individual cankers. Growth was rapid from April to November and ceased for 1–3 mo. or more during winter. About 90 percent of the annual growth occurred from April 1 to November 1, and only 2.5 percent from December to February. Temperature is believed to have been one of the factors governing the time of rapid canker growth. The time of breaking of the peridia on the cankers and of the buds of deciduous trees in the spring are considered as probable indicators of the time of canker growth acceleration, while the time of leaf cast of deciduous trees in the fall is suggested as a probable indicator of the time of canker growth retardation.

Willow scab, Fusicladium saliciperdum (All. et Tub.) Lind., F. A. MCCORMICK. (Conn. [New Haven] Expt. Sta.). (*Mass. Forest and Park Assoc., Tree Pest Leaflet 35 (1939), pp. [4], figs. 3*).—An informational leaflet.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Report of the Chief of the Bureau of Biological Survey, 1939, I. N. Gabrielson (*U. S. Dept. Agr., Bur. Biol. Survey Rpt., 1939, pp. 75*).—This final report from the Department of Agriculture (E. S. R., 81, p. 753) includes data on the status and management of wildlife, including migratory waterfowl, banding game and other birds, distribution and migration, wildlife relationships to forest and range, biological research on wildlife refuges, wildlife management research, and biological surveys and fauna; economic research on wildlife, including waterfowl management investigations, mosquito control in wildlife habitat, laboratory research in food habits, cooperative studies of food habits, field investigations of migratory game birds, studies of nutrition of upland game birds, and field studies of injurious birds and mammals; research in fur production and the fur trade; research in wildlife disease control, including diseases of fur animals and game birds; restoration of wildlife habitat by refuge development; maintenance and operation of national wildlife refuges; cooperative predator and rodent control; research in control methods; wildlife conservation in Alaska; and miscellaneous administrative data.

Observations on the birds of northern Venezuela, A. Wetmore (*U. S. Natl. Mus. Proc., 87 (1939), No. 3073, pp. 173–260*).—Observations made in northern Venezuela during the latter part of October 1937 of North American bird migrants that appeared at Ocumare de la Costa are included in this report. Note is made of the tremendous loss of life that results in the migrants' journey from North to South America. It was observed that on the open shore small feathered migrants often made a land fall in a state of evident exhaustion. "Blackpoll warblers that travel south through the eastern United States late in September with their bodies so cased in oily fat that the skin is fairly distended reached the Venezuelan coast with this reserve entirely exhausted and even the body muscles obviously thin and wasted. . . . Some obviously had barely made a land fall after an exhausting sea journey, as in some of those that I handled the flight muscles that move the wings were reduced to thin bands through which the angular ridges of the breast bone projected. One yellow-billed cuckoo found freshly dead in the bushes back of the beach in early morning had evidently arrived too exhausted to survive, as little remained of its once strong muscles except flaccid bands over its bones. It was easy to visualize the hundreds and thousands that wandered over the water until they fell to drown, and the hundreds of others that arrived only to succumb to the strains imposed by the exhausting journey."

Sex ratio and weights of crows wintering in Oklahoma, R. H. Imler and F. B. McMurry (*Wilson Bul., 51 (1939), No. 4, p. 244*).

Food of the short-eared owl during migration through Pennsylvania, P. E. Randall. (Pa. State Col.). (*Wilson Bul., 51 (1939), No. 4, p. 243.*)

The life history of Henslow's sparrow (Passerherbulus henslowi (Audubon)), A. S. Hyde (*Mich. Univ., Mus. Zool. Misc. Pub. 41 (1939), pp. 72, pls. 4, figs. 4*).—This report of studies of the life history and habits of Henslow's sparrow is presented with a 12-page list of references to the literature.

The watcher at the nest, M. M. Nice (*New York: MacMillan Co., 1939, pp. [9]+159, [figs. 21]*).—Intensive observations of the life history and habits of the song sparrow (*Melospiza melodia*) (pp. 1–75) and observations of the cowbird (*Molothrus ater*) (pp. 76–85), magnolia warbler (*Dendroica magnolia*) (pp. 86–93), black-throated green warbler (*D. virens*) (pp. 94–102), ovenbird (*Seiurus aurocapillus*) (pp. 103–111), Bell vireo (*Vireo belli belli*) (pp. 112–118), mourning dove (*Zenaidura macroura*) (pp. 119–127), yellow-crowned night

heron (*Nyctanassa violacea*) (pp. 128–134), and bobwhite (*Colinus virginianus*) are presented, with notes on many other species.

What snake is that? R. Conant and W. Bridges (*New York and London: D. Appleton-Century Co., 1939, pp. VIII+163, pls. [36]*).—A field guide to the snakes of the United States east of the Rocky Mountains.

Fieldbook of Illinois land snails, F. C. Baker (*Ill. Nat. Hist. Survey Manual 2 (1939), pp. XI+166, [pl. 1], figs. [130]*).—This pocket manual includes a bibliography (pp. 153–155), a check list of land snails (pp. 159, 160), and a subject index (pp. 161–166).

The nematode Skrjabingylus chitwoodorum n. sp. from the skunk, W. C. Hill. (Okla. A. and M. Col.). (*Jour. Parasitol., 25 (1939), No. 6, pp. 475–478, figs. 7*).—The nematode parasite *S. chitwoodorum*, 2 to 50 specimens of which were found present in the frontal sinus of the skull of each of 5 skunks (*Mephitis mesomelas mesomelas* and *Spilogae interrupta*), collected in Oklahoma, is described as new.

A new unarmed tapeworm from the spotted skunk, H. J. Peery. (Okla. A. and M. Col.). (*Jour. Parasitol., 25 (1939), No. 6, pp. 487–490, figs. 2*).—A new anoplocephalid cestode found to parasitize the spotted skunk (*Spilogale interrupta*) near Perkins, Okla., in March 1939, is described as new under the name *Oochoristica oklahomensis*.

Blood parasites of California birds, W. B. Herms, C. G. Kadner, P. Galindo, and V. and D. F. Armstrong. (Univ. Calif. et al.). (*Jour. Parasitol., 25 (1939), No. 6, pp. 511, 512*).—In a survey conducted in an effort to expand the knowledge of avian blood parasites in western birds, examinations were made of 150 individuals, representing 30 species, of which 41, comprising 6 species, were found to be infected. Members of the genera *Plasmodium*, *Haemoproteus*, and *Trypanosoma* were encountered. The details of these findings are included.

A new species of Diorchis (Cestoda: Hymenolepididae) from the canvasback, L. H. Long and N. E. Wiggins. (Okla. A. and M. Col.). (*Jour. Parasitol., 25 (1939), No. 6, pp. 483–486, figs. 5*).—A tapeworm parasite of a canvasback duck taken near Stillwater, Okla., in March 1939, is described as new under the name *Diorchis nyrocae*.

Tatria duodecacantha, a new species of cestode (Amabiliidae Braun 1900) from the pied-billed grebe (Podilymbus podiceps podiceps Linn.)), O. W. Olsen. (Minn. Expt. Sta.). (*Jour. Parasitol., 25 (1939), No. 6, pp. 495–499, figs. 14*).—A tapeworm collected from the pied-billed grebe (*P. podiceps podiceps*) in Iowa is described as new under the name *T. duodecacantha*.

Studies on monogenetic trematodes.—I, New species from the warmouth bass, J. D. Mizelle and A. Seamster. (Okla. A. and M. Col.). (*Jour. Parasitol., 25 (1939), No. 6, pp. 501–507, figs. 41*).

Destructive and useful insects: Their habits and control, C. L. Metcalf and W. P. Flint (*New York and London: McGraw-Hill Book Co., 1939, 2. ed., pp. XVI+981, figs. 584*).—A complete revision of the early edition of this work (E. S. R., 60, p. 648), to which much new material has been added.

[Notes on economic insects and their control] (*Jour. Econ. Ent., 32 (1939), No. 6, pp. 879–890, figs. 6*).—The contributions presented (E. S. R., 82, p. 353) are: Injury to Sweet Corn by *Euxesta stigmatias* Loew in Southern Florida, by G. W. Barber (pp. 879, 880) (U. S. D. A.); A New Host Plant and Locality Record for the Christmas Berry Thrips [*Photinia arbutifolia* Lindl.], by R. M. Bohart (pp. 880, 881) (Univ. Calif.); Host Plants Harboring *Aplanobacter stewarti* Without Showing External Symptoms After Inoculation by *Chaetocnema pulicaria*, by F. W. Poos (pp. 881, 882) (U. S. D. A.); Recovery From Excreta

of the Pigeon of Viable Eggs of the Giant Thorny-Headed Worm [*Macracanthorhynchus hirudinaceus*] of Swine, by R. D. Glasgow and P. DePorte (p. 882); Control of Blackflies (Simuliidae), by R. D. Glasgow (pp. 882, 883); *Thrips nigropilosus* Uzel, a Nonvector of the Yellow Spot Virus, by K. Sakimura (p. 883) (Hawaii. Pineapple Prod. Expt. Sta.); Derris for Ants and Wasps, by W. Downes (pp. 883, 884); The Effect of Previous Diet on the Toxic Action of Lead Arsenate to a Leaf-Feeding Insect, by M. C. Swingle (p. 884) (U. S. D. A.); A Method for Studying the Fauna of Mushroom Manure, by C. A. Thomas and J. L. Horsfall (p. 885) (Pa. Expt. Sta.); The Golden Codling Moth *Carpocapsa pomonella* (L.) var. *simpsonii* Busck, by E. O. Essig (pp. 885, 886) (Univ. Calif.); Swarm of *Thyanta custator* (F.), by C. N. Ainslie (p. 886); A Collecting Net With a Detachable Zipper Bag, by C. A. Dambach (pp. 886, 887) (Ohio State Univ.); *Neodiprion sertifer* (Geoff.), a Pine Sawfly Accidentally Introduced Into New Jersey From Europe, by J. V. Schaffner, Jr. (pp. 887, 888) (U. S. D. A.); Comstock's Mealybug *Pseudococcus comstocki* (Kuw.) on Apple in Ohio, by C. R. Cutright (p. 888) (Ohio Sta.); and The Propagation and Introduction of *Coccophagus heteropneusticus* Comp., a Parasite of Lecaniine Scale Insects, by S. E. Flanders (pp. 888–890) (Calif. Citrus Sta.).

[Insect pest control] (*U. S. Dept. Agr., Sec. Agr. Rpt., 1939, pp. 153–158*).—The progress of control work with insect pests of cotton (the bollweevil and the pink bollworm), the Japanese beetle, European corn borer, grasshoppers, and the Mormon cricket is reported.

A simple method to use in recovering feces at measured intervals, K. L. Harris (*Science, 91 (1940), No. 2349, pp. 23, 24*).—An outline is given of a method that was used to determine accurately the larval life history of the imported cabbageworm and which could be used in toxicological investigations on many leaf-feeding insect larvae.

Flight habits of the raisin moth and other insects as indicated by the use of a rotary net, D. F. Barnes, C. K. Fisher, and G. H. Kaloostian. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 6, pp. 859–863, fig. 1*).—A rotary net developed during the summer of 1935 by F. R. Lawson and J. C. Chamberlin for use in studies on the migration of the beet leafhopper was employed in the studies here reported. This motor-driven rotary net, operated in a fig orchard near Fresno, Calif., captured 12,600 raisin moths from July 12 to November 6, 1937. "The flight habits of the raisin moth (*Ephestia figulilella* Greg.) and of *Cnemeplatia sericea* Horn were studied in detail by making collections at intervals of 15 min. on six nights. The raisin moth began to fly about 35 min. after sunset; females were the most active early in the evening. Flight was controlled by light intensity. *C. sericea* exhibited a restricted flight period of about 45 min. just before darkness set in. Counts were made of dried fruit beetles (*Carpophilus hemipterus* (L.)), staphylinid beetles, and honeybees that were taken in the collections. Since the rotary net is nonselective, it offers a useful means for obtaining information about the aerial activity of both sexes of flying insects at any time of day or night."

Common insects attacking sugar beets and vegetable crops in the Salt River Valley of Arizona, K. B. McKinney. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 6, pp. 808–810*).—The author presents a list of 73 identified species of insects, and mentions several unidentified forms found attacking 19 different truck and garden crops in the Salt River Valley of Arizona during the period from 1932 to 1937, inclusive.

[Work in entomology by the Illinois Station], W. P. Flint, J. H. Bigger, M. D. Farrar, C. M. Packard, J. R. Holbert, L. H. Shropshire, C. C. Compton, R. A. Blanchard, A. F. Satterthwaite, S. C. Chandler, O. T. Bonnett, J. J.

PIEPER, C. M. WOODWORTH, E. W. CAULEY, T. CLEAVER, D. POWELL, A. S. COLBY, C. W. KEARNS, and W. E. MCCAULEY. (Coop. U. S. D. A. et al.). (*Illinois Sta. Rpt. 1937, pp. 161–181*).—The activities of the year (E. S. R., 78, p. 218) dealt with include the use of resistant strains of hybrid corn for control of the chinch bug, control work with white grubs in corn and in pastures, importance of data obtained on insects during years of light infestation, 5-yr. study of fluctuations of the corn earworm, reduction in damage from hessian fly by periodic seasonal warnings, resistance of lespedeza and crotalaria to insect attack, studies of new strains of alfalfa for leafhopper resistance, special formula for poisoning grasshoppers in soybeans, Chlorasol and Larvacide safe fumigants for grain, protection of young trees from borer attack by wrapping, destruction of all bark beetles on trees by painting with a paradichlorobenzene mixture, bordeaux-nicotine superior to new sprays for leafhopper control, necessity for mounding in peach borer treatments with paradichlorobenzene, control work with the plum curculio and the oriental fruit moth, fixed nicotines for codling moth control, control work with the San Jose scale and the round-headed apple borer, the red spider on raspberries, light traps for the control of insects, control of the cyclamen mite by the use of naphthalene compounds, leaf tier best controlled by the use of lead arsenate during early period of growth, effective control of symphylids by the use of steam or carbon disulfide, control of red spider on carnations by naphthalene fumigation, and value of sodium fluoride in control of moths.

[**Work in entomology by the South Dakota Station**], H. C. SEVERIN, W. R. HORSFALL, and N. P. LARSON (*South Dakota Sta. Rpt. 1939, pp. 46–48, figs. 2*).—The work of the year (E. S. R., 81, p. 239) reported upon includes studies of the effect of the red mite ***Eutrombidium trigonum*** Herm. upon grasshoppers, grasshopper baits, and the importance of beetle larvae as natural enemies of grasshoppers.

Sixty-ninth annual report of the Entomological Society of Ontario, 1938 (*Ent. Soc. Ontario, Ann. Rpt., 69 (1938), pp. 139, figs. 18*).—Contributions presented in this report (E. S. R., 80, p. 367) include the following: The Progress of Economic Entomology in Ontario Since the Organization of Our Society in 1863, by L. Caesar (pp. 7–10); The History of Entomology in Nova Scotia, Particularly in Respect to the Activities of Provincial Authorities, by A. D. Pickett and H. G. Payne (pp. 11–15); Historical Notes on the Development of Entomology in Quebec, by G. Maheux (pp. 16, 17); Status of the Japanese Beetle in the Older Area of Infestation, by C. H. Hadley (pp. 18–21) (U. S. D. A.); Recent Extensions of the Known Distribution of the European Spruce Sawfly, by A. W. A. Brown and H. S. Fleming (pp. 22–28); The Oviposition Habits of Some of the Species of the Genus *Exenterus* Parasitic on Sawfly Larvae, by J. M. Barclay (pp. 29–31); A Laboratory Method for the Propagation of *Microcryptus basizonius* Grav., by T. U. Green (pp. 32–34); A Note on the Mating of *Coelopisthia nematicida* (Pack.) Hewitt, by L. R. Finlayson (pp. 34, 35); The Pine Spittle Bug *Aphrophora parallela* Say as a Pest of Scotch Pine Plantations, by A. H. MacAndrews (pp. 35–37); Forest Tent Caterpillar in Ontario, 1931–1938, by A. W. A. Brown (pp. 37–42); Some Notes on the Gypsy Moth Eradication Campaign in New Brunswick, and the Japanese Beetle Preventive Work, by L. S. McLaine (pp. 43–45); The Forest Insect Survey for 1938, by A. W. A. Brown (pp. 45–52); Further Observations on the Biology of the Apple Maggot (*Rhagoletis pomonella* Walsh), by J. A. Hall (pp. 53–58) (E. S. R., 80, p. 223); Miscellaneous Notes on the Codling Moth, by W. G. Garlick (pp. 58–61); On the Biology of the Codling Moth in Quebec, by A. Beaulieu (pp. 61–65); Biological Control of the Oriental Fruit Moth (*Laspeyresia molesta* Busck) in Ontario—

A Review of Ten Years' Work, by W. E. van Steenburgh and H. R. Boyce (pp. 65–74); A Strain of *Trichogramma semblidis* Aus. From Prince Edward County, Ontario, Canada, by W. E. van Steenburgh (pp. 74, 75); Further Notes on [European] Corn Borer Resistance in Hybrid Corn, With a Brief Statement of the Infestation Situation in Ontario in 1938, by R. W. Thompson (pp. 76–81) (E. S. R., 80, p. 368); Some Field Observations on the Biology of *Chelonus annulipes* Wesm., an Introduced Braconid Parasite of the European Corn Borer, by H. G. James (pp. 82–84); Some Observations on the Effect of Temperature on the Sex Ratio of a Hymenopterous Parasite *Chelonus annulipes* Wesm., by G. Wishart (pp. 85–87); White Grub Prospects in Ontario for 1939, by G. H. Hammond (pp. 87–90); The Most Vulnerable Stage in the Life Cycle of June Beetles, by G. Maheux and G. Gauthier (pp. 90–93); Recent Developments in Cabbage Worm Control on Long Island, by H. C. Huckett (pp. 93–96); Notes on the Armyworm (*Leucania unipuncta* Haw.) Outbreak in Ontario in 1938, by A. W. Baker (pp. 96–99); The 1939 Outbreak of the Armyworm in Quebec, by G. Maheux and P. Lagloire (pp. 99–101); Control of the House Cricket, by L. Caesar and G. G. Dustan (pp. 101–105); The Mullein Leaf Bug *Campylomma verbasci* Meyer as a Pest of Apple in Nova Scotia, by A. D. Pickett (pp. 105, 106); An Outline of the Life History of the Hop Vine Borer (*Gortyna immanis* Guenee, With Notes on Its Control, by H. A. Gilbert (pp. 107–114); Report on a Test of Tartar Emetic as a Control for the Gladiolus Thrips, by W. G. Matthewman and A. G. Dustan (p. 114); Preserving Insect Specimens and Preparing Material for Display, by R. L. Post (pp. 115–119); The Value of Predatory Birds, by W. E. Saunders (pp. 119, 120); and A Summary of the Insect Pest Situation in Canada in 1938, by C. R. Twinn (pp. 121–134).

The control of Diaprepes abbreviatus L. and Lachnosterna (Phytalus) smithi Arrow in Barbados surveyed over a period of eleven years, R. W. E. Tucker (*Agr. Jour.* [*Barbados*], *8* (*1939*), *No. 1, pp. 8–18*).

[Insects of Venezuela] (*Jour. Agr. Univ. Puerto Rico* [*Col. Sta.*], *23* (*1939*), *No. 4, pp. 177–264*).—This contribution is presented in two parts.

Insects observed in the State of Aragua, Venezuela, South America, L. F. Martorell (pp. 177–232).—The author presents a systematically arranged annotated list of the insects collected in Aragua during a period of 14 mo. Some of the forms listed are said to be new to Venezuela.

Additional insect records from Venezuela, L. F. Martorell and A. Escalona Salas (pp. 233–252).—Records of insects collected in the vicinity of Maracay, State of Aragua, in May 1935 and at Valera, State of Trujillo, in May 1936 by the junior author and in the State of Monagas in August 1937 by the senior author supplement data presented in the above list.

Report on insect pests of crops in England and Wales, 1935–1937 ([*Gt. Brit.*] *Min. Agr. and Fisheries Bul. 118* (*1939*), *pp. VI+64, fig. 1*).—Following a discussion of the developments in methods of control, introduced pests, and general notes, a tabular list of records of occurrence of insect pests is presented, followed by a list of references to the subject published in Great Britain from 1935 to 1937.

[Contributions on economic insects and insecticides] (*Iowa State Col. Jour. Sci.*, *14* (*1939*), *No. 1, pp. 22, 23, 39, 53, 54, 81–83*).—Theses contributions, abstracts of which are presented, are: Effects of Toxic Compounds on the Gustatory Chemoreceptors in Certain Diptera, by C. C. Deonier (pp. 22, 23), Effect of Ether on the Toxicity of Certain Fumigants to the Confused Flour Beetle (*Tribolium confusum* Duval), by H. Gunderson (p. 39), Insecticidal Action of Some Substituted Pyrrolidines, by J. G. Kirchner (pp. 53, 54), and The Culture of Fly Larvae for Use in Maggot Therapy, by S. W. Simmons (pp. 81–83) (all Iowa State Col.).

The chemistry and toxicology of insecticides, H. H. SHEPARD (*Minneapolis, Minn.: Burgess Pub. Co., [1939], pp. [1]+III+383, figs. 40*).—This mimeographed work is presented in 11 chapters, each of which is accompanied by a bibliography of the more important literature relating to the subject under consideration, and an appendix. In presenting the important facts and theories relative to insecticides, the author includes not only the chemical, physical, and toxicological aspects but also information regarding the history and commerce pertaining to this field. It is pointed out that while this text is not merely an annotated bibliography, it is primarily a guide to insecticide literature. Methods of insect control are not given except as the action of specific insecticides is illustrated.

Analysis of the water extract of derris and cubé, L. D. GOODHUE and H. L. HALLER. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 6, pp. 877–879*).—Chemical examinations of water extracts of seven samples of derris, cube, and timbo have revealed that from 24 to 41 percent of the active material can be removed by one extraction, and successive extractions remove more. When preserved against fermentation, these suspensions of the active principle are very stable. Both glucose and levulose were found to be present in one sample. The glucosides similar to saponin had no hemolytic power.

Further studies of methyl bromide as an insect fumigant, H. H. SHEPARD and A. W. BUZICKY. (Minn. Expt. Sta.). (*Jour. Econ. Ent., 32 (1939), No. 6, pp. 854–859, figs. 2*).—The results of tests (E. S. R., 77, p. 660; 79, p. 74) of the relative toxicity of fumigants to different species of insects at 25° C. and a 5-hr. exposure and relation of the toxicity of methyl bromide to temperature as expressed by the median lethal concentrations for 5-hr. exposures are reported in tables. The larvae of the black carpet beetle were found to be the most resistant to methyl bromide of the insects tested. "Differences in the speed of toxic action of fumigants were tested. Hydrocyanic acid exhibited no delayed action, all exposed insects being either dead or alive and active at the end of the exposure period. Insects exposed to carbon disulfide were anesthetized and exhibited partial recovery before many individuals succumb[ed]. Those exposed to methyl bromide at higher concentrations than necessary to kill 100 percent seemed normally active immediately after exposure. Data relative to the influence of low temperature upon the toxicity of methyl bromide were completed. The added lethal effect of the low temperature appeared to be a function of the cold resistance of the particular insect species concerned. Temperature appeared to have no effect upon the flour absorption ratio. Baking tests with flour fumigated with methyl bromide at 2 lb. per 1,000 cu. ft. showed no detectable injury."

Additional records on the effectiveness of several insecticides against three cotton insects, G. L. SMITH, A. L. SCALES, and R. C. GAINES. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 6, pp. 798–802*).—The information presented, which relates to the bollweevil, the cotton leaf worm, and the tarnished plant bug, supplements the earlier work reported (E. S. R., 78, p. 662; 80, p. 651). Details are given in six tables.

A survey of field infestations of insects attacking corn in the ear in South Carolina, O. L. CARTWRIGHT. (S. C. Expt. Sta.). (*Jour. Econ. Ent., 32 (1939), No. 6, pp. 780–782, figs. 6*).—A summary of data on 10,000 ears of corn examined in the field before harvest in South Carolina during 1938 reveals State-wide averages as follows: Corn earworm entrance 93.82 percent, corn earworm damage 84.14, flour beetle (*Cathartus cassiae* (Reiche)) infestation 57.71, pink corn worm (*Pyroderces rileyi* Wlsm.) infestation 61.05, angoumois grain moth infestation 31.04, and rice weevil infestation 28.02 percent.

[Contributions on fruit insects] (*Ohio State Hort. Soc. Proc., 72 (1939), pp. 32–44, 48–61*).—Contributions relating to fruit insects and their control presented at the annual meeting of the Ohio State Horticultural Society, January 30 to February 1, 1939, include Recent Experiments in Codling Moth Control, by C. R. Cutright and M. A. Vogel (pp. 32–39) (Ohio Expt. Sta.); Recent Studies and Trends in Codling Moth Control in Indiana, by G. E. Marshall (pp. 39–44) (Ind. Sta.); Non-arsenical Mixtures for Control of the Grape Berry Moth, by G. A. Runner (pp. 48–53) (U. S. D. A.); and European Red Mite and Aphis, by T. H. Parks (pp. 53–61) (Ohio State Univ.).

Cultural practices and their influence upon citrus pests, W. L. THOMPSON. (Fla. Expt. Sta.). (*Jour. Econ. Ent., 32 (1939), No. 6, pp. 782–789*).—It is concluded that "heavy inert residue sprays of copper and zinc compounds not only inhibit the growth of entomogenous fungi which attack scale insects but create a condition favorable for purple [scale] and Florida red scale development, which appears to overshadow any appreciable effect the scale fungi might have. Purple scales were more abundant on trees with a high percentage of green leaves, where a magnesium deficiency had been corrected, than on trees with a high percentage of bronzed leaves, where the magnesium deficiency still existed."

Common insects of lawns, ornamental shrubs, and shade trees, G. S. LANGFORD and E. N. CORY (*Md. Univ. [Agr.] Ext. Bul. 84 (1939), pp. 54, figs. 36*).—A practical account of the more important of these insects and means for combating them.

Observations on the biology of Saperda tridentata Oliv. and Magdalis armicollis Say (Coleoptera), C. H. HOFFMANN. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 6, pp. 848–851*).—A study of the biology of the elm borer and the red elm bark weevil here reported upon was conducted with special reference to their feeding and oviposition habits and the possibility of their serving as inoculation agents for the Dutch elm disease fungus.

Insect collections and rearings on castor bean plants, with especial reference to grasshoppers, R. C. SMITH. (Kans. Expt. Sta.). (*Jour. Econ. Ent., 32 (1939), No. 6, pp. 749–758, figs. 10*).—Following a review of the literature with 24 references, the results of tests with grasshoppers caged over castor-bean plants are reported and grasshopper feeding observations noted. An annotated list of some 75 insects found on field plantings of castor-beans in Kansas in 1938 is presented. Mention is made of unidentified species collected.

The possibility of intestinal myiasis in man, W. A. RILEY. (Univ. Minn.). (*Jour. Econ. Ent., 32 (1939), No. 6, pp. 875, 876*).

Factors influencing the absorption of sodium fluoride by the American cockroach, G. L. HOCKENYOS (*Jour. Econ. Ent., 32 (1939), No. 6, pp. 843–848*).—In experimental work conducted, the details of which are presented in 12 tables, the body integument of the American cockroach was found to have the properties of a semipermeable membrane coated with a film of water-resisting fat or oil. The rate of absorption of sodium fluoride is influenced by the osmotic force exerted by the body fluid and by various factors that act upon the oil film. These factors are temperature and chemicals that either absorb or react with the film.

Notes on the Lachnini of Florida, with descriptions of two new species (Homoptera: Aphiidae), A. N. TISSOT. (Fla. Expt. Sta.). (*Fla. Ent., 22 (1939), No. 3, pp. 33–48, figs. 57*).—Included in these notes are descriptions of *Cinara newelli* n. sp. taken on *Pinus palustris* at Welaka, Fla., and *C. watsoni* n. sp. taken on *P. taeda* at Gainesville, Fla.

Combatting aphids on citrus, J. R. WATSON. (Fla. Expt. Sta.). (*Fla. Grower, 48 (1940), No. 1, p. 4*).

Studies in the biology and control of Pseudococcus comstocki Kuwana on citrus in Palestine, E. Rivnay (*Hadar, 12 (1939), No. 7, pp. 197–201, figs. 3*).—In control work with oils containing certain emulsifying agents, a thiocyanate compound and soap gave the most satisfactory kill of all the substances tested. The continuous effect of the residual oil upon larvae during a certain period was demonstrated. An attempt to control the mealybug by the liberation of *Sympherobius amicus* failed.

The hydrogen ion concentration of the digestive fluids and blood of the codling moth larva, J. Marshall. (Wash. Expt. Sta.). (*Jour. Econ. Ent., 32 (1939), No. 6, pp. 838–843, fig. 1*).—Studies of the H-ion concentration of the digestive fluids and blood of the codling moth larva reported have been summarized as follows: "Colorimetric determinations of the crop and ventriculus of first instar larvae agreed reasonably well with those of third to fifth instar larvae, though somewhat more variable. They indicated the H-ion concentration of these portions to be in the neighborhood of pH 8.5 in the first instar, and perhaps slightly higher in the later instars. Potentiometric determinations for third to fifth instar larvae indicated an average pH of 8.7, and from this it is assumed the actual pH for first instar larvae may likewise reach 8.7. The alimentary fluids of the codling moth larva are evidently well buffered, though the nature of the buffer or buffers was not investigated. Ingestion of the acid pulp of an unripe apple did not appreciably reduce the active alkalinity of these fluids. The H-ion concentration of the blood of the fourth instar codling moth larva was found to be between pH 6.7 and pH 6.8. The importance of the internal environment of the larva in relation to control by alimentary poisons is briefly discussed."

Light traps and codling moth control, D. W. Hamilton and L. F. Steiner. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 6, pp. 867–872, figs. 2*).—Report is made upon the progress of the study of light traps commenced in the spring of 1934 and conducted on a large scale with a view to determining their value as a control measure for the codling moth and the relative efficiency of the light sources available for such traps. Investigations conducted on a relatively large scale at Orleans, Ind., during 1934 and 1935 and continued on a small scale at Poughkeepsie, N. Y., during 1936, in which different types of lamps were tested, indicated that the mercury vapor tube and the G–1 mercury vapor lamp are about equally attractive to codling moths and definitely superior to Mazda lamps of 200 w. or less. "The results showed that the lamps used were not powerful enough to attract moths much farther than 35 ft. Fifteen traps hung over open spaces averaged only 5 moths per trap as compared to 127 for those in adjacent trees. In 1934 at Orleans codling moth infestation in the 5¼-acre area containing light traps was reduced 44 percent below that in the surrounding check blocks. The area was normally one of the most seriously injured in the orchard. In 1935 seasonal conditions were extremely unfavorable for the codling moth, and the lighted area showed a reduction of 90 percent in infestation. Because they artificially stimulate activity during hours when the natural light is too weak for normal activity, light traps are good indicators of moth abundance, but are less informative than bait traps as to normal flight activity. Whereas light traps captured more moths per trap than nearby bait traps, the percentage of females was much smaller. Releases of marked moths indicated that moths left the light-trap area as well as entered, and some apparently remained within the area as long as 11 days before capture. The most recoveries were made the first or second night after release."

Lead arsenate combinations and nicotine combinations as control measures for the codling moth, 1938, P. G. Lamerson and R. L. Parker. (Kans.

Expt. Sta.). (*Jour. Econ. Ent.*, *32* (*1939*), *No. 6*, *pp. 828–832*).—Report is made of work conducted during 1938 in continuation of comparative tests (E. S. R., 80, p. 659) on insecticide combinations as substitutes for lead arsenate in spraying for the control of the codling moth. The five high-ranking combinations tested, arranged in the order of their effectiveness, were (1) lead arsenate plus Sprasoy, (2) lead arsenate plus Verdol, (3) lead arsenate plus soybean flour, (4) lead arsenate plus Superla, and (5) lead arsenate plus Orthol K oil. Combinations of lead arsenate with a summer oil emulsion or a soybean flour produced better control of codling moth during the 1938 season of normal or nearly normal rainfall than did the nicotine combinations. Combinations of soybean flour and lead arsenate produced severe injury to leaves and fruit. Lead arsenate alone ranked lowest in effectiveness during the season of frequent early-season rains. Lead arsenate-oil combinations proved superior to any of the nicotine combinations. The apples from all lead arsenate plats after being washed were below the arsenic tolerance of 0.01 gr. per pound of apples. Samples of apples from the nicotine plats did not show the presence of nicotine at the time of harvest.

Diamond-back moth investigation in New Zealand, P. L. ROBERTSON (*New Zeal. Jour. Sci. and Technol.*, *20* (*1939*), *Nos. 5A*, *pp. 330A–340A*, *figs. 4*; *6A*, *pp. 341A–364A*, *figs. 6*).—This report on the biology, occurrence, and natural enemies of the diamondback moth, one of the major pests in New Zealand, includes a list of 36 references to the literature.

Control of the American strawberry leaf roller Ancylis fragariae in the lower Missouri River Valley, P. G. LAMERSON and R. L. PARKER. (Kans. Expt. Sta.). (*Jour. Econ. Ent.*, *32* (*1939*), *No. 6*, *pp. 824–828*).—Insecticide tests for the control of *A. fragariae* during the season of 1938 indicated that "nicotine sulfate 40 percent, or 50 percent free nicotine in combination with summer oil emulsion, proved to be the most effective insecticide when applied during the time interval between the first hatched larvae and the first rolled leaves. This effectiveness held true for all three broods when sprays were timed correctly and applied three times at 5-day intervals. Beginning with the second brood of [American] strawberry leaf roller, lead arsenate sprays, or cryolite sprays in combination with National Oil Products Company neutral soluble fish oil, gave control equal to nearly 40 percent nicotine sulfate or 50 percent free nicotine sprays. To obtain best results, these sprays had to be timed for broods and applied often enough to protect newly unfurled foliage. A strong pyrethrum dust (0.8 percent) appeared to be the most effective remedy after the leaves were rolled. This dust appeared to be 96.8 percent effective against larvae in rolled leaves."

Further investigations on the control of the velvetbean caterpillar (Anticarsia gemmatilis (Hbn.)), L. O. ELLISOR and E. H. FLOYD. (La. Expt. Sta.). (*Jour. Econ. Ent.*, *32* (*1939*), *No. 6*, *pp. 863–867*).—In reporting further (E. S. R., 80, p. 657) on the control of the velvetbean caterpillar, the results of laboratory and field experiments with insecticides conducted in 1938 are presented. "As revealed by laboratory tests, Dutox, Alorco cryolite, Syncrolite, basic lead arsenate, and basic copper arsenate are highly toxic to the caterpillars, but dual fixed nicotine, derris dust, magnesium arsenate, and Dusting cryolite exhibit little or no toxicity. Basic lead arsenate, injurious to soybean foliage, was not used in field tests. In field tests, Alorco cryolite, Dutox, Syncrolite, and basic copper arsenate gave good control of caterpillars without damaging soybean foliage. Basic copper arsenate exhibited unusual sticking properties and retained its toxicity several weeks after application."

Insecticide tests for bollworm control during 1938, J. C. GAINES. (Tex. Expt. Sta.). (*Jour. Econ. Ent.*, *32* (*1939*), *No. 6*, *pp. 821–824*).—In further experi-

ments (E. S. R., 78, p. 365), calcium arsenate-paris green (93-7), armyworm poison, and three calcium arsenates were equally effective in controlling the bollworm. It is pointed out that the tests do not alter the earlier findings (E. S. R., 81, p. 247) that calcium arsenate applied at the rate of from 8 to 9 lb. per acre is effective and is the most economical control for the bollworm.

New Jersey Mosquito Extermination Association, twenty-sixth annual meeting (*N. J. Mosquito Extermin. Assoc. Proc., 26 (1939), pp. 228+[3], pls. 4, figs. 12*).—Contributions presented at the annual meeting of the association held at Atlantic City in March 1939 (E. S. R., 81, p. 681) include the following: Relation of Mosquito Control to Wildlife, by T. J. Headlee (pp. 5–12) (N. J. Expt. Stas.); The Fundamental Principles of Biological Control of Insects, by J. L. King (pp. 13–20) (U. S. D. A.); Biological Control of Mosquitoes—A Special Problem in Applied Ecology, by R. D. Glasgow (pp. 20–30); A Documented Record of a Long Flight of *Aedes sollicitans*, by D. P. Curry (pp. 36–39). Effect of Ditching for Mosquito Control on the pH of Marsh Soils, by F. C. Daigh and L. A. Stearns (pp. 39–43) (Del. Sta.); Summary of Mosquito Control Work in New Jersey in 1938, by T. D. Mulhern (pp. 46–90) (N. J. Stas.); Advances in Knowledge of Mosquitoes During 1938, by F. C. Bishopp and J. L. Webb (pp. 94–106) (U. S. D. A.); Will Mosquito-Control Ditches, if not Maintained, Make Mosquito Breeding Worse?—A Correction, by F. C. Bishopp and C. N. Smith (pp. 106, 107) (U. S. D. A.) (E. S. R., 74, p. 71); Mosquito Suppression Work in Canada in 1938, by A. Gibson (pp. 109–116); Progress of Mosquito Control in Massachusetts, by E. Wright (pp. 121–124), in Connecticut, by R. C. Botsford (pp. 127–132) (Conn. [New Haven] Sta.), in New York City, by R. W. Gies (pp. 140–143), in Delaware During 1938, by W. S. Corkran (pp. 143–147), in Delaware County, Pa., by R. L. Mentzer (pp. 148–151), and in the Vicinity of Salt Lake City, by D. M. Rees (pp. 155–160); The Effects of the September Hurricane on Mosquito Ditches, by M. Price (pp. 125–127); Public Relations to Mosquito Control, by B. M. Mitchell (pp. 132–135); Ditch Lining in Virginia, by R. E. Dorer (pp. 152–154); Mosquito Control in New Jersey, by W. H. Martin (pp. 160–164) (N. J. Stas.); Mosquito Control Work and Industrial Development, by J. H. Rosecrans (pp. 164–166); Interference With Mosquito Control Works Resulting From Hydraulic Filling, by J. E. Brooks (pp. 166, 167), and by Real Estate Developments and by Individuals, Clubs, and Corporations, by A. W. Kelley (pp. 168–170); The Passaic Valley Mosquito Control Project, by A. R. Cullimore and R. L. Vannote (pp. 170–172); and A Review of Mosquito Control Methods and the Place Which Each Occupies, by T. J. Headlee (pp. 183–187) (N. J. Stas.).

Two simuliids found feeding on turkeys in Virginia, G. W. UNDERHILL. (Va. Expt. Sta.). (*Jour. Econ. Ent., 32 (1939), No. 6, pp. 765–768*).—The determination that *Simulium nigroparvum* Twinn may transmit *Leucocytozoon smithi*, a protozoan disease of turkeys in Virginia, as reported by Johnson et al. (E. S. R., 79, p. 687), led to a study of the simuliids or blackflies in that State. In addition to *S. nigroparvum*, *S. slossonae* (D. & S.) was found attacking the turkey. "Over the mountainous area of Virginia, *S. nigroparvum* occurs in the larger rivers which have rather flat, rocky bottoms. The heaviest infestations have been observed where the water willow (*Dianthera americana*) was present and where the current was 4 to 5 ft. per second. Larvae, pupae, cocoons, and adults have been taken in large numbers. Female adults were captured while feeding on turkeys. Females of *S. slossonae* were taken only in New Kent County. Adults have not been reared by the author, and at present the type of stream in which they breed is not known. The female flies attached themselves to the head and neck region of the turkey. About 2 to 3 min. were required to engorge. They bit any hour of the day from early morning to late afternoon.

Most feeding was done when the humidity was relatively high, atmospheric pressure low, and when the temperature was 75° to 85° F. Flies in captivity did not feed on turkeys."

A control for the larvae of houseflies in manure piles, R. W. FAY. (Ill. Expt. Sta. et al.). (*Jour. Econ. Ent., 32 (1939), No. 6, pp. 851–854*).—The method reported for the control of housefly larvae in manure piles involves piling the manure into ricks with sides as nearly perpendicular as possible and constructing a ditch along the sides of the rick. The upper surface of the manure is covered with tar paper or burlap impregnated with creosote. If the air temperature is as high as 80° F. for a period of 5 hr. during the time the cover is in place, all larvae in the manure will be killed. The cover may be removed at the end of 5 days, and no further infestation by houseflies will occur.

Changes in the concentration of urease during pupal development of the blowfly Phormia regina, W. ROBINSON and C. S. WILSON. (U. S. D. A.). (*Jour. Parasitol., 25 (1939), No. 6, pp. 455–459, fig. 1*).—Determination was made of the enzyme urease at various intervals during pupal development of the blowfly *P. regina*. "The pupal stage is particularly suitable for this study, as drastic changes in the anatomy and physiology take place with no appreciable fluctuations in weight. The concentration of urease was found to increase rapidly [to] about 57 percent toward the middle of the pupal period and to fall off again still more abruptly. Changes occurred throughout the whole period. Especial comment is made on the peculiar specificity of this enzyme for the metabolic waste product urea. The strict economy in the use of nutrients which is necessary during pupation is discussed, along with the possible re-utilization of ammonium carbonate, a break-down product of this enzyme upon urea."

Protein lures for fruitflies, M. MCPHAIL. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 6, pp. 758–761*).—The results of preliminary tests with protein impurities and to determine attractiveness of different protein lures to fruitflies are reported in tables. It was found "that proteins in the presence of sodium hydroxide solution made very satisfactory field lures for the Central American fruitfly *Anastrepha striata* Schiner. The following proteins or substances containing protein were tested individually: Casein, gelatin, filter-press mud, bakers' yeast, cowhide with hair attached, cow blood, white of egg, and wheat shorts. Each produced an attractive lure, indicating that the phenomenon was true of proteins in general. Preliminary studies on concentration of lure with respect to protein content and sodium hydroxide content suggested fruitful fields of study, as did also a consideration of hydrolytic agents other than sodium hydroxide. Products of protein hydrolysis were considered. Some of the amino acids appeared promising."

A note on parasitism of the leaf miner Agromyza melampyga Loew., H. R. BOYCE (*Canad. Ent., 71 (1939), No. 12, p. 267*).—Parasitism of the leaf miner *A. melampyga* on syringa at Belleville, Ont., by the chalcid *Closterocerus tricinctus* Ashm. to an extent of 25 percent and by *Pnigalii maculipes* Cwfd., *P. felti* Cwfd., *Pnigalii* sp., *Halticoptera aenea* Walk., and *Diaulences pulchryses* Cwfd. is noted.

A new genus of Scarabaeidae, with descriptions and notes on Phyllophaga, M. W. SANDERSON. (Univ. Ark.). (*Jour. Kans. Ent. Soc., 12 (1939), No. 1, pp. 1–15, figs. 19*).—The genus *Benedictia* is erected, and a description is given of a new species of the genus (*B. pilosa*) from Texas and three new species of *Phyllophaga*, including one from Texas and two from Alabama. Notes on additional species are included.

Experiments on control of Japanese beetle larvae with β, β′-dichloroethyl ether, A. HARTZELL and F. WILCOXON (*Contrib. Boyce Thompson Inst., 10 (1939),*

No. 4, pp. 509–513, fig. 1).—In continuation of work (E. S. R., 82, p. 510), in which it was shown that β,β'-dichloroethyl ether could be successfully used for greenhouse fumigation to control a number of insect pests, experiments were conducted with this insecticide for the control of Japanese beetle larvae in turf. It was found that the saturated aqueous solution with the addition of 0.1 percent Tergitol 7 penetrant, a sulfated alcohol, gives a satisfactory control of the grubs when two applications are made about 1 week apart during the period when they are near the surface of the soil. Increasing the amount of Tergitol 7 penetrant increased the effectiveness of the mixture but led to injury of the grass. This mixture offers promise in cases where it is desired to avoid the use of materials which leave poisonous residues, such as lead arsenate, and where a rapid kill is required.

Spray experiments for the control of the elm leaf beetle, C. E. Hood. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 6, pp. 833–838, figs. 3*).—In experiments conducted it was shown that good control of the elm leaf beetle can be obtained with a mixture of 3 lb. of lead arsenate to 100 gal. of water, plus fish oil as an adhesive. This mixture should be applied, if possible, between the time of final issuance of the insect from hibernation (about May 25) and June 10 in the New England States.

Planting dates as affecting wireworm injury to potato tubers, W. A. Rawlins. (Cornell Univ.). (*Jour. Econ. Ent., 32 (1939), No. 6, pp. 761–765, figs. 2*).—Report is made of wireworm injury and infestation on underground parts of plants, including tubers, stems, stolons, and seed pieces, as related to planting dates. It was found that the eastern field wireworm ceased to feed after the first part of September and migrated away from the immediate vicinity of the tubers. Most of the wireworms burrow downward sometimes as far as 2 ft. It was observed that with the eastern field wireworm only a portion of the population was attracted to the potato hill at any one time during the summer. An average of approximately 50 percent was near the tubers during August when the largest number of wireworms was recorded in the potato hills. The remaining portion of the population was either between rows or below the 6-in. level. The results of these studies show that in western New York potatoes should be planted as late in the planting period as is economically feasible. Early-planted potatoes were more severely injured by the eastern field wireworms than late-planted potatoes. Since late-planted potatoes set tubers in late August the crop is not subject to wireworm attack for as long a period as early-planted potatoes which set tubers in late July and early August.

While a number of species of wireworms have been collected from potato fields, only three are common and numerous. Of these the wheat wireworm and the eastern field wireworm are most abundant and injurious, although in a few cases a corn wireworm, *Melanotus* sp., has caused considerable damage.

The effect on humans of the ingestion of the confused flour beetle, H. B. Mills and J. H. Pepper. (Mont. Expt. Sta.). (*Jour. Econ. Ent., 32 (1939), No. 6, pp. 874, 875*).—In experiments reported, no evidence was gathered which would indicate that injury to human beings would result from the ingestion of confused flour beetles as they may accidentally occur in cooked cereals.

The cigarette beetle as a pest of cottonseed meal, E. A. Back. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 6, pp. 739–749, figs. 7*).—A study of the cigarette beetle, the principal pest of cottonseed meal in the warehouse, where it is a source of real loss through destruction of the sacks and to the outer 2 to 3 in. of the commodity in sacks or in bulk, is reported upon. Where no remedial measures are taken, new stock becomes infested by spread from old stocks. It is

considered probable that the only meal sold that is entirely free from this pest is that ground after cold weather stops insect migrations and that sold before warm weather in the spring permits the flight of adults. The report deals with the distribution of the cigarette beetle in sacked meal and in bulk meal, attachment to sacks, presence in refuse meal, destruction of sacks, breaking of sacks confined to areas of infestation, spread by flight of the adults, parasites, other insects involved, fumigation, and control recommendations.

Certain aspects of the white-fringed beetle problem, J. T. CREIGHTON. (Univ. Fla.). (*Jour. Econ. Ent., 32 (1939), No. 6, pp. 768–780, figs. 14*).—Observations of host relationships; woodland infestations; larval populations in the soil; trap crops; barriers; barrier trenches; metal barriers, including the details of their construction; fallowing operations; disked test plats; poison dusts; use of weed killers; tree banding; and tests in forest areas for control of the white-fringed beetle *Pantomorus* (*Naupactus*) *leucoloma* (Boh.) are reported upon.

Distribution of the vegetable weevil in Arkansas, D. ISELY. (*Univ. Ark.*). (*Jour. Kans. Ent. Soc., 12 (1939), No. 1, p. 30*).

Progress report on mixtures of calcium arsenate and sulfur for control of the boll weevil at State College, Miss., R. L. MCGARR. (U. S. D. A., Miss. Expt. Sta., et al.). (*Jour. Econ. Ent., 32 (1939), No. 6, pp. 792–794*).—In tests in which $\frac{1}{10}$-acre plats were dusted with a 1:2 mixture of calcium arsenate and sulfur, a 1:1 mixture of calcium arsenate and sulfur, and calcium arsenate alone, each replicated 12 times for control of the bollweevil, very little difference was observed in the control obtained. Tests on $\frac{2}{3}$-acre plats on which "a comparison was made of results from a 1:2 mixture of calcium arsenate and sulfur and from calcium arsenate alone, on early-planted cotton with a light weevil infestation, gave practically no gains from either treatment. Similar large plats dusted with a 1:1 mixture of calcium arsenate and sulfur and with calcium arsenate alone, on late-planted cotton with heavy weevil damage in untreated plats, gave large gains and profits in both cases, with slightly better results from the mixture than from the calcium arsenate."

Boll weevil control tests with calcium arsenates containing different percentages of water-soluble arsenic pentoxide, R. C. GAINES. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 6, pp. 794–797*).—Tests of calcium arsenate in the field following cage tests by Smith, Scales, and Gaines (E. S. R., 80, p. 651) and laboratory tests by Gaines (E. S. R., 80, p. 660), which included many localities with different soils, climatic and growth conditions, and varying degrees of weevil infestation, are reported, the details being given in tables. "There was no significant difference between calcium arsenates containing low, intermediate, and high percentages of water-soluble arsenic pentoxide by the New York method [E. S. R., 75, p. 8]. The only significant differences were between poison treatments and the untreated checks."

Early versus late poisoning and a combination of both for boll weevil control, F. F. BONDY. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 6, pp. 789–792*).—In field experiments with the bollweevil conducted at Florence, S. C., in 1938, in which calcium arsenate and several mixtures containing calcium arsenate were applied to cotton in presquare and early treatments, presquare and late treatments, and late treatments alone, none of the presquare or early treatments when used alone gave satisfactory control. "The most economical gain, based on cost of production, was obtained by the use of a dust mixture of calcium arsenate and hydrated lime after 10-percent square infestation. Owing to the necessity of using as little calcium arsenate as possible to avoid soil injury and heavy aphid infestations, the use of a mixture of molasses, water, and

calcium arsenate in the presquare stage, followed by dusting with a mixture of calcium arsenate and hydrated lime after 10-percent square infestation, is considered the most practical method of bollweevil control on light sandy soils."

Control of the boll weevil on sea-island cotton, P. M. GILMER. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 6, pp. 802–805*).—This further report (E. S. R., 80, p. 664) relates to experiments conducted at Tifton, Ga., in 1938, in which year sea-island cotton was heavily infested and severely damaged by the bollweevil. All of the plats to which insecticides were applied gave increases in yield over the untreated check plat, the treatments being effective in the order listed, namely, calcium arsenate applied at the rate of 6.5 lb. per acre per application when 5 percent of the squares were infested (intensive dust series), calcium arsenate applied at the same rate when 10 percent of the squares were infested (standard dust series), and calcium arsenate, sirup, and water (5 lb. to 1 gal. to 49 gal.) applied at the rate of 15 to 25 gal. per acre throughout the season (sprayed series). The gains in yield and improvement in grade from weevil control resulted in an increased crop value, over cost of treatments, of about $10 per acre in the dusted plats and about $4 in the sprayed plats.

Toxicity studies of so-called "inert" materials with the rice weevil and the granary weevil, S. F. CHIU. (Cornell Univ.). (*Jour. Econ. Ent., 32 (1939), No. 6, pp. 810–821, figs. 14*).—In continuation of the earlier studies (E. S. R., 81, p. 552), the author has found in laboratory experiments that certain so-called inert materials when applied as a dust are effective against the rice and the granary weevils. Of six materials tested, crystalline silica was the most effective, magnesium carbonate, amorphous silica, bentonite, talc, and walnut-shell flour being less effective in the order named. "Within a certain range, there is a definite correlation between toxicity and particle sizes of the crystalline silica dust, higher insecticidal efficiency being obtained with finer particles. The relative humidity of the environment is an important factor influencing the toxicity of the crystalline silica dust. The killing effect is much quicker at low relative humidities than at high relative humidities. It was found that insects dusted with effective inert materials lost weight very rapidly, which is assumed to be mainly due to the loss of water from the body. Based on observations of (1) the loss of weight of dusted insects, (2) the difference in insecticidal efficiency of the inert material when used against insects provided with food and without food, and (3) the toxicity of the inert material at saturated atmosphere, it is believed that the insects are killed by the inert materials through desiccation and through mechanical irritation."

Factors influencing the formation of the venom of the honeybee, W. M. LAUTER and V. L. VRLA (*Jour. Econ. Ent., 32 (1939), No. 6, pp. 806, 807*).—The author has found that the honeybee produces about half of its venom within the first 5 days of its life, and that it keeps its venom intact at least up to the twenty-fifth day. "A sugar diet devoid of pollen is undesirable for the production of bee venom. A possibility might exist of artificially supplying proteins to be used in the synthesis of bee venom by the insect."

The comparative value of honeybees in the pollination of cultivated blueberries, F. R. SHAW, J. S. BAILEY, and A. I. BOURNE. (Mass. State Col.). (*Jour. Econ. Ent., 32 (1939), No. 6, pp. 872–874*).—Experiments conducted over a period of 3 yr. in Massachusetts have shown that honeybees are effective as pollinators of cultivated blueberries. Under the conditions of the experiments the bumblebees were the most important insects pollinating cultivated blueberries. Honeybees were second in importance, solitary bees third. The bumblebees worked approximately three times as fast as did the honeybees.

ANIMAL PRODUCTION

[Investigations in animal production] (*U. S. Dept. Agr., Sec. Agr. Rpt., 1939, pp. 132–135, 146*).—Progress is reported in the development of strains of beef cattle having marked resistance to heat and humidity, methods for increasing the fertility of breeding mares, improved methods of preserving semen for artificial insemination, methods of rating the fleece of sheep at an early age, short-cut methods for trap-nesting poultry, increased effectiveness of the National Poultry Improvement Plan, mineral supplements for correcting phosphorus deficiency of range cattle, the carotene requirements of farm animals, the effect of cottonseed meal and bulls for fattening cattle on the quality of beef, soft fat in pork, and the protein requirements of poultry.

[Livestock investigations in Illinois], H. P. RUSK, R. R. SNAPP, S. BULL, W. E. CARROLL, E. W. BURROUGHS, H. H. MITCHELL, T. S. HAMILTON, W. T. HAINES, F. SIMPSON, W. G. KAMMLADE, J. R. BEADLES, F. I. NAKAMURA, J. B. SHIELDS, W. A. RUTH, L. E. CARD, H. J. SLOAN, F. B. ADAMSTONE, B. R. BURMESTER, H. M. SCOTT, E. ROBERTS, W. E. NEVENS, and W. W. YAPP (*Illinois Sta. Rpt. 1937, pp. 88–97, 101–104, 106–127, 129, 130, 142–144, 155, 156*).—Brief progress results are presented for the following lines of investigation: Hydraulic soybean oil meal v. solvent-extracted soybean oil meal as a protein supplement for fattening beef cattle; the value of soybean oil meal, dried brewers' grains, and oats as partial substitutes for corn in the ration of beef calves; comparative costs of producing beef on pasture and in dry lot; the gains secured from grazing yearling beef heifers on timothy, bromegrass, orchard grass, bluegrass, reed canary grass, and mixed oats and grass pastures; the effect of bluegrass on the quality of beef; the use of winter rye pastures for bred sows; the protein requirements of pigs of various weights; the value of supplements for sows and their litters on pasture; the method of evaluating pastures for growing-fattening pigs; the value of molasses as a substitute for corn in hog feeding; the use of oat flour for preventing rancidity in bacon, frozen pork, and lard; the value of adding yeast to lamb-fattening rations; the minimum protein requirements of lambs; the effect of heating on the nutritive value of soybeans; varietal differences in the quality of protein of soybeans; and the use of hybrid corn and legume crops for silage.

Reports of poultry investigations include the relation of vitamin E to fowl health, and the physiology of thick egg white formation.

[Livestock investigations in Mississippi] (*Miss. Farm Res.* [*Mississippi Sta.*], *2* (*1939*), *No. 12, pp. 1, 2, 6, 7*).—Results are briefly noted on economical methods of utilizing sorghum silage, Johnson grass and soybean hays, cottonseed hulls, and cottonseed meal in the winter ration of beef cattle, by H. H. Leveck; the potential increase in returns from livestock farming through improved methods of producing mules, beef cattle, hogs, and sheep, by C. Dorman; and the factors involved in low-cost turkey production, by G. R. Sipe.

[Livestock investigations in South Dakota] (Partly coop. U. S. D. A.). (*South Dakota Sta. Rpt. 1939, pp. 17–22, 23, 24, 37–41, figs. 3*).—Progress reports of livestock investigations, by J. W. Wilson, T. Wright, I. B. Johnson, F. U. Fenn, and J. Watson, include a comparison of protein supplements for beef calves, with particular reference to the palatability and value of tankage; a comparison of creep feeding v. no supplementary feed for suckling beef calves; Sooner milo v. corn for fattening pigs; a comparison of corn and heavy-weight, medium-weight, and light-weight barleys in pig-fattening rations; the influence of forage for fattening pigs on the quality and palatability of pork; the comparative returns secured from fattening lambs v. gummer

western ewes with corn or barley as the principal feeds; a comparison of corn and alfalfa, corn and wild hay, oats and alfalfa, oats and wild hay, and cottonseed cake and alfalfa as rations for pregnant ewes; and at the Belle Fourche Field Station at Newell lamb feeding tests using corn, barley, beet pulp, beet tops, molasses, corn silage, and alfalfa hay in various combinations; sheep grazing tests with alfalfa and sweetclover; and the practicability of breeding ewe lambs at 9 or 10 mo.

Reports of poultry investigations, by W. E. Poley, A. L. Moxon, and W. O. Wilson, include the value of millet grains in growing and laying rations for chickens; the tolerance of growing chicks for grains containing selenium; a comparison of high and low grades of grain for poultry; the influence of common grains on poultry carcass quality; the relative efficiency of corn, wheat, barley, and oats in turkey rations; and factors affecting the hatchability of turkey eggs.

Digestibility studies with ruminants, V, VI (*Sci. Agr., 20 (1939), Nos. 3, pp. 175–192; 4, pp. 238–253*).—Two additional reports in this series are noted (E. S. R., 82, p. 89).

V. *Associative digestibility among roughages and succulent feeds*, C. J. Watson, W. M. Davidson, J. C. Woodward, C. H. Robinson, and G. W. Muir.—Trials were conducted to measure the change in digestibility of certain roughages and succulent feeds due to the incorporation of each of these feeds in a ration with one other feed, the digestibility of one of the individual components in each mixed ration being compared with its digestibility when fed alone. Three series of experiments dealt, respectively, with the effect of the addition of oat hulls to hay, corn silage, and mangels; the effect of the addition of straw to hay and corn silage; and the effect of the addition of hay to silage and mangels. Data accruing from these trials are presented in detail. No associative effect so far as total digestibility and total digestible nutrients were concerned was found to exist among hay, oat straw, corn silage, and mangels. The digestibility of oat hulls calculated for a mixed ration with either hay, corn silage, or mangels was lower than the digestibility of hulls when fed alone. The trend of nitrogen digestibility did not generally follow the trend of total digestibility. The addition of hay to silage or mangels tended to decrease the digestibility of nitrogen, whereas with the addition of oat hulls to hay or silage the digestibility of nitrogen in the mixture tended to increase.

VI. *Associative digestibility of grains: Barley, oats, and oil cake*, C. J. Watson, J. A. Campbell, W. M. Davidson, C. H. Robinson, and G. W. Muir.—Using Shorthorn steers as experimental animals as in previous trials, the coefficients of digestibility of the following six rations were studied: (1) Hay, (2) hay plus barley, (3) hay plus oats, (4) hay plus oil cake meal, (5) hay plus oats plus barley, and (6) hay plus oats plus barley plus oil cake meal. The data are presented in detail. It is concluded that there is no associative effect between barley and oats. The data regarding the barley-oats-oil cake combination were not so clear-cut, but if any real differences in digestibility due to an associative effect existed they were of small magnitude.

Utilization of feed by the growing animal, H. W. Titus. (U. S. D. A.). (*Flour & Feed. 40 (1939), No. 7, pp. 8, 9, figs. 7*).—A general discussion, with particular reference to the efficiency of feed utilization as a function of age and of live weight.

Effect of hydrolysis on the nutritive value of casein, E. L. R. Stokstad. (Univ. Calif.). (*Poultry Sci., 19 (1940), No. 1, pp. 42–48, figs. 2*).—The nutritive value of a number of enzyme-digested casein preparations was compared with

whole casein in a series of chick growth experiments. Three different enzyme digests were employed, and the degree of hydrolysis of the digested caseins ranged from 47.7 to 79.2 percent. When fed as protein supplements at levels ranging from 5 to 30 percent, the digested casein proved inferior to whole casein in each instance, despite the fact that feed consumption was essentially the same for each type of diet. The inferiority of the digested casein could not be explained on the basis of partial amino acid deficiency. Furthermore, the presence of the digested casein in diets already containing adequate amounts of whole casein resulted in depressed growth rates.

Effect of season (temperature) on blood lipids, O. B. HOUCHIN and C. W. TURNER. (Mo. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc., 42 (1939), No. 2, pp. 477–479*).—Data obtained on mature New Zealand White female rabbits over a complete year gave evidence of a marked seasonal variation in the concentration of plasma blood fat for this species. With animals subjected to an outdoor environment, average blood fat values ranged from 384 mg. percent in June to 36 mg. percent in February. Animals maintained in temperature-regulated rooms at a temperature of about 80° F. maintained rather constant plasma fat levels.

The feeding of phosphate to animals in their drinking-water, P. J. DU TOIT, A. I. MALAN, and P. K. VAN DER MERWE (*Farming in So. Africa, 14 (1939), No. 164, pp. 429–433, 438, figs. 2*).—Data are reported on the monthly average phosphorus content of pasture herbage in the major areas of South Africa. The estimated phosphorus intake of cattle and sheep on such pastures indicates the need of a phosphorus supplement during most of the year. A plan is presented for adding a concentrated phosphorus solution to the drinking water of grazing animals at a cost considerably less than that of supplying additional phosphorus through the use of bonemeal licks.

The calcium-phosphorus ratio, R. W. FAIRBANKS. (Univ. Ill.). (*North Amer. Vet., 20 (1939), No. 1, pp. 17–21*).—A review, with 20 references to the literature.

Cobalt in nutrition, R. W. FAIRBANKS. (Univ. Ill.). (*North Amer. Vet., 20 (1939), No. 3, pp. 33–38*).—A review, with 36 references to the literature.

The influence of arsenic and certain other elements on the toxicity of seleniferous grains, A. L. MOXON and K. P. DUBOIS. (S. Dak. Expt. Sta.). (*Jour. Nutr., 18 (1939), No. 5, pp. 447–457, figs. 3*).—This is a more comprehensive report of research previously noted (E. S. R., 80, p. 239). In addition to the protective action against selenium toxicity of 5 p. p. m. of arsenic in the drinking water of rats, it was found that 5 p. p. m. of tungsten in the drinking water partially prevented the typical liver damage caused by the seleniferous diet and decreased mortality. All other elements used in this regard tended to increase mortality.

The diagnosis of nutritional diseases of swine, cattle, and sheep, J. SAMPSON. (Univ. Ill.). (*North Amer. Vet., 20 (1939), No. 3, pp. 30–32*).—A brief note on clinical symptoms accompanying certain nutritive deficiency diseases and the possible use of field and laboratory tests in their diagnosis.

Vitamins and vitamin preparations in small animal practice, M. L. MORRIS and W. C. RUSSELL. (N. J. Expt. Stas.). (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. 752, pp. 555–566, fig. 1*).—A general discussion, with 32 references to the literature.

Minimum vitamin A and carotene requirements of mammalian species, H. R. GUILBERT, C. E. HOWELL, and G. H. HART. (Univ. Calif. coop. U. S. D. A.). (*Jour. Nutr., 19 (1940), No. 1, pp. 91–103, fig. 1*).—Employing the same procedure as that used in earlier experiments with cattle, sheep, and swine (E. S. R., 77, p.

830), the vitamin A and carotene requirements of the horse were studied. Horses on vitamin A-deficient rations became depleted so that symptoms of vitamin A deficiency were detectable in from 265 to 439 days. The minimum requirement of this species was found to be from 17 to 22 International Units of vitamin A and from 20 to 30 μg. of carotene daily per kilogram of body weight. The previously published data on the vitamin A requirements of cattle, sheep, and swine have been reevaluated and are presented in summary form. The requirements of these several species are similar to but slightly higher than those of the horse. The necessity of two standards of requirements, one for vitamin A and one for carotene, is discussed.

Preservation of seminiferous epithelium and fertility in male rats on vitamin E-low rations supplemented by α-tocopherol, H. M. EVANS and G. A. and O. H. EMERSON. (Univ. Calif.). (*Anat. Rec., 74 (1939), No. 3, pp. 257–271, figs. 11*).—Three groups of male rats, 21 days of age, all received a standard vitamin E-low diet. The animals in group 1 received in addition a daily dosage of 0.75 mg. of α-tocopherol dissolved in 80 mg. of ethyl laurate, group 2 animals received 80 mg. of wheat-germ oil of tested potency daily, and group 3 animals the ethyl laurate alone in an amount equal to that allowed group 1. Examinations made after 4 mo. on the above diets indicated that the rats receiving α-tocopherol were protected against extensive degeneration of the seminiferous epithelium, and further that the sexual responses of these animals and their capacity to sire normal young were also preserved. Those receiving wheat-germ oil were similarly protected against tubular degeneration, but sexual responses in this group were subnormal. The E-low group maintained normality of the accessory organs of reproduction, but showed impaired sexual responses and complete failure to sire young.

Cure and prevention of vitamin E-deficient muscular dystrophy with synthetic α-tocopherol acetate, G. C. KNOWLTON, H. M. HINES, and K. M. BRINKHOUS (*Soc. Expt. Biol. and Med. Proc., 42 (1939), No. 3, pp. 804–809, figs. 3*).—This contribution from the University of Iowa presents experimental evidence that subcutaneous injections of synthetic α-tocopherol acetate are effective in both the cure and prevention of nutritional muscular dystrophy in rats which were maintained from an early age on a vitamin E-deficient diet.

Restoration of fertility in successively older E-low female rats, G. A. EMERSON and H. M. EVANS. (Univ. Calif.). (*Jour. Nutr., 18 (1939), No. 5, pp. 501–506*).—A more detailed report of research previously noted (E. S. R., 82, p. 231).

Vitamin K, E. A. DOISY, S. B. BINKLEY, S. A. THAYER, and R. W. MCKEE (*Science, 91 (1940), No. 2351, pp. 58–62*).—A summary dealing with sources of vitamin K, bio-assay, isolation and constitution of the factor, the antihemorrhagic potency of various synthetic compounds, and symptoms of vitamin K deficiency.

Vitamin K deficiency and prothrombin levels: Effect of vitamin K administration, R. T. TIDRICK, F. T. JOYCE, and H. P. SMITH (*Soc. Expt. Biol. and Med. Proc., 42 (1939), No. 3, pp. 853–857, figs. 2*).—In a detailed study at the University of Iowa concerning the rate of decline of plasma prothrombin in newly hatched chicks maintained on a vitamin K-deficient diet, it was found that whole blood clotting time became prolonged when the prothrombin level fell to about 30 percent of the normal level for chicks of the same age. This occurred at about the seventh day of life. Hemorrhages occurred when the prothrombin reached approximately 10 percent of normal. The administration of large doses of vitamin K corrected the plasma prothrombin deficit almost completely in 6 hr., while smaller doses effected partial recovery in 6 hr. and almost complete recovery in 18 hr.

The anti-hemorrhagic activity of pure synthetic phthiocol, H. J. Almquist and A. A. Klose. (Univ. Calif.). (*Jour. Amer. Chem. Soc., 61 (1939), No. 6, p. 1611*).—A preliminary announcement is made of the discovery of an antihemorrhagic activity of pure synthetic phthiocol. It is suggested that phthiocol is the simplest member of a homologous series of antihemorrhagic substances.

Vitamin K activity of synthetic phthiocol, E. Fernholz and S. Ansbacher (*Science, 90 (1939), No. 2331, p. 215*).—Confirmatory evidence is presented regarding the vitamin K activity of synthetic phthiocol.

Sprouted fodder and germinated grain in stock feeding, I. Leitch (*Imp. Bur. Anim. Nutr. [Aberdeen], Tech. Commun., 11 (1939), pp. 63*).—A patented process for the production of sprouted grains, including the equipment and technic, is described. Data are presented on the changes in composition of plants during germination and early growth and on the composition of the sprouted fodder used in feeding tests. Experiments with dairy cows showed no special advantage in sprouted fodder for milk production, but indicated that it could successfully replace an equivalent amount of silage or kale in the ration. Tests with beef cattle in which sprouted barley replaced an equivalent amount of seed in the ration showed no improvement in the rate or econmoy of gains. When sprouted corn replaced an equivalent amount (dry matter) of swedes in the ration, significant improvement in the rate of gain was obtained. The results from feeding sprouted fodder were negative in trials with growing calves and fattening pigs. No conclusive evidence was obtained to indicate that germinated oats had a beneficial effect on reproduction in farm animals. The addition of sprouted grain to the ration of laying hens without green feed or hay meal improved egg yield and the fertility and hatchability of eggs. The cost of sprouted fodder production and its economy in livestock feeding are discussed.

The preservation of the "grass juice factor" in silage, B. C. Johnson, C. A. Elvehjem, W. H. Peterson, and H. J. Fagen. (Wis. Expt. Sta.). (*Jour. Nutr., 18 (1939), No. 5, pp. 527–535, figs. 4*).—Comprehensive assays of a number of samples of fresh forages (including several common grasses and legumes), and of silages prepared from them, using either sulfuric and hydrochloric acids (A. I. V. process), phosphoric acid, or molasses as preservatives, gave evidence that the grass-juice factor is quite well preserved by ensiling. The A. I. V. and phosporic acid methods gave better preservation of the factor than the molasses method. Milk from cows fed phosphoric acid alfalfa silage was found approximately as rich in the grass-juice factor as milk produced on summer pasture.

Commercial feeding stuffs from September 1, 1938, to August 31, 1939, F. D. Fuller and J. Sullivan (*Texas Sta. Bul. 578 (1939), pp. 205*).—Included in this annual report (E. S. R., 80, p. 524) are tabulations of the guaranties and analyses of 3,613 samples of feeding stuffs submitted to chemical analysis and microscopic examination during the year ended August 31, 1939, the results of bio-assay of 26 vitamin D carriers, and hardness tests for 24 samples of cottonseed cake. Separate tables indicate the average composition, digestible protein, and productive energy of many feeding stuffs analyzed, and the average, minimum, and maximum protein content of cottonseed products from each oil mill in the State. Information is included on the chemical standards for various byproducts and special-purpose mixed feeds and definitions of and standards for commercial unmixed feeds.

Pine disease in sheep, H. H. Corner (*Agr. Prog. [Agr. Ed. Assoc., Gt. Brit.], 16 (1939), No. 2, pp. 181–187*).—A brief summary of the extent of affected areas in Great Britain and the effectiveness of a cobalt supplement in combating this disorder.

The water-soluble B-vitamins other than aneurin (vitamin B_1), riboflavin, and nicotinic acid required by the pig, H. CHICK, T. F. MACRAE, and A. J. P. and C. J. MARTIN (*Biochem. Jour., 32 (1938), No. 12, pp. 2207–2224, figs. 2*).—To test whether a yeast eluate factor and a yeast filtrate factor (E. S. R., 82, p. 297) were essential in the nutrition of pigs, they were fed a highly purified diet adequate except for the B complex and supplemented with aneurin, riboflavin, and nicotinic acid. Under these conditions growth ceased within 3–5 weeks. The addition of either the eluate factor or the filtrate factor to the above diet permitted slow growth for a brief period, but this was again arrested after 4–6 weeks. Specific deficiency symptoms occurring in the absence of each of these factors are described. The addition of both fractions to the basal supplemented diet resulted in immediate response in food intake and good growth, indicating that they contained essential dietary factors for this species. The addition of at least 4 percent of dried yeast to the basal diet was required to permit optimum growth.

Feeding problems in relation to bacon production, R. G. BASKETT (*Agr. Prog. [Agr. Ed. Assoc., Gt. Brit.], 16 (1939), No. 2, pp. 188–194*).—The results are summarized for a series of feeding experiments comparing rations containing 30, 40, and 60 percent of corn meal, and 60 percent of degermed corn meal for fattening bacon pigs. Average daily gains were similar for all lots, ranging from 1.24 to 1.3 lb., and dressing percentages were practically identical. The pounds of concentrate required per pound of gain were 3.81, 3.83, 3.57, and 3.68 for rations 1 to 4, respectively. Refractive index values for back-fat samples were similar, while iodine values were highest at the highest level of corn meal feeding. Groups receiving 30 and 40 percent of corn meal had a higher percentage of pigs in top grades, while those receiving degermed corn meal had the highest percentage of low grading carcasses.

Death losses in newborn pigs, L. P. DOYLE (Purdue Univ.). (*Vet. Med., 34 (1939), No. 9, pp. 554, 555; abs. in Vet. Med., 34 (1939), No. 10, pp. 597, 598*).—Post-mortem examinations of a large number of pigs from field cases and from experiments revealed certain lesions to be fairly constant. The most nearly constant pathological changes were enlarged and very friable livers showing degenerative fatty infiltration and also degenerative changes of the kidneys. Feeding experiments with pregnant sows indicated that the feeding of a good quality protein to sows during the entire gestation period materially reduced mortality in young pigs as compared with sows receiving only grain and minerals.

The pH (hydrogen ion concentration) of the contents of the digestive canal of the equine, E. E. LEASURE, R. P. LINK, and J. H. WHITLOCK. (Kans. Expt. Sta.). (*Cornell Vet., 29 (1939), No. 4, pp. 362–366*).—The material used in this study was obtained from aged horses of unknown history. All determinations were made within a few minutes after the animals were slaughtered. The average pH of the contents of the various sections of the digestive tract were as follows: Stomach, 4.458; duodenum, 7.13; jejunum, 7.467; ileum, 7.548; cecum, 7.235; large colon, 7.09; and rectum, 6.24. The pH of stomach contents ranged from 2.01 to 8.6. A rather wide range extending from acid to alkaline was noted in all other sections of the tract examined.

Nutritional requirements of dogs, A. ARNOLD and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. 749, pp. 187–194, figs. 4*).—The observed maintenance requirement of dogs was found to agree well with predicted values based on a formula presented by workers at the Missouri Experiment Station (E. S. R., 72, p. 823). The food requirements of growing dogs were found to be approximately twice those required for

maintenance. In the presence of a favorable calcium: phosphorus ratio the vitamin D requirement of dogs was found to be similar to that of other species, such as the chick. Twenty International Units of vitamin D per 100 gm. of a vitamin D-low diet proved adequate. The thiamin requirement of dogs was of the same order as that of chicks and rats, 80 μg. per 100 gm. of diet giving complete protection against anorexia. The requirements of dogs for riboflavin and nicotinic acid, as indicated by other reports, are discussed.

Recent developments in canine nutrition, H. H. MITCHELL. (Univ. Ill.). (*North Amer. Vet., 20 (1939), No. 12, pp. 24–29*).—A brief review, with 28 references to the literature.

Vitamin E deficiency in dogs, H. D. ANDERSON, C. A. ELVEHJEM, and J. E. GONCE, JR. (Wis. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc., 42 (1939), No. 3, pp. 750–755, figs. 7*).—Pups produced from dogs which had been maintained for long periods on a diet of mineralized evaporated milk developed severe deficiency symptoms which appeared identical with muscular dystrophy resulting from vitamin E deficiency as previously described in rats, guinea pigs, and rabbits. Administration of synthetic α-tocopherol to the pups at the onset of this disorder completely cured it. Animals which had reached an advanced stage of muscular dystrophy responded to administration of α-tocopherol by showing a marked improvement in vitality, muscle tone, and growth, although they failed to overcome a deformed posture.

The dog food testing program, H. H. MITCHELL. (Univ. Ill.). (*North Amer. Vet., 20 (1939), No. 10, pp. 46–52*).—A discussion of a proposed plan for evaluating dog foods, involving both chemical analyses and biological tests. Data from tests are presented to illustrate the application of the plan.

Nutrition experiments with foxes and minks, J. K. LOOSLI and S. E. SMITH. (U. S. D. A., Cornell Univ., et al.). (*Amer. Fur Breeder, 12 (1940), No. 7, pp. 6, 8, 12*).—A brief progress report.

The importance of herbage in poultry management, C. L. GISH and L. F. PAYNE. (Kans. Expt. Sta.). (*Poultry Sci., 19 (1940), No. 1, pp. 35–41*).—In a trial extending over a complete laying year, three lots of White Leghorn pullets fed complex well-balanced rations received in addition (1) a commercial mixture of condensed buttermilk and dehydrated grass, (2) cereal grasses (either as oat silage or fresh grass), and (3) condensed buttermilk plus dehydrated alfalfa leaf meal. Average egg production per hen for the year was 170.05, 163.13, and 149.46 for lots 1, 2, and 3, respectively. The superior production of lot 1 over lots 2 and 3 and of lot 2 over lot 3 was statistically significant. No significant difference between pens occurred with reference to egg size, hatchability of eggs, or livability. A relatively high rate of mortality occurred in all lots. The birds in lots 1 and 2 did not have as severe a winter pause and were also able to overcome it in less time than those in lot 3. The birds in lot 2 when fed oat silage produced a high percentage of olive-colored egg yolks, which reduced their market value, thus tending to counteract the larger net returns secured per bird in this lot.

The utilization of food elements by growing chicks.—VIII, A comparison of alfalfa meal and artificially dried Sudan grass meal in rations for growing chicks, C. W. ACKERSON, M. J. BLISH, and F. E. MUSSEHL (*Nebraska Sta. Res. Bul. 116 (1939), pp. 7*).—Continuing this series of studies (E. S. R., 81, p. 409), the effect of replacing 10 percent of alfalfa meal in the ration with artificially dried Sudan grass meal (cut at the 12-in. stage) on an equivalent protein basis was determined in a growth and body analysis experiment with day-old chicks. The chicks of both lots consumed equal amounts of dry matter during the trials. Neither the growth rate to 6 weeks of age nor the retention

of nitrogen, calcium, and phosphorus were significantly altered by the substitution, indicating that artificially dried Sudan grass meal can be used to replace alfalfa meal in a ration for growing chicks.

The value of corn gluten meal for feeding poultry, R. C. RINGROSE, L. C. NORRIS, and G. F. HEUSER (*[New York] Cornell Sta. Bul. 725 (1939), pp. 18, fig. 1*).—In a series of experiments utilizing corn gluten meal in the rations of growing chicks and laying hens it was found that protein combinations of good quality could be obtained in rations containing this feeding stuff by including a limited quantity of some material rich in lysine, such as milk or meat-scrap protein, or both. Nitrogen-balance experiments indicated that meat scrap or milk protein exerted a marked supplementary effect upon the proteins contained in a basal ration composed chiefly of yellow corn meal, wheat flour middlings, and corn gluten meal. Additional proteins from wheat byproducts or ground oats had practically no supplementary effect on the protein in this basal ration, although they did exert a growth-stimulating effect. In a ration in which from 38 to 44 percent of the total protein was from corn (largely from corn gluten meal) the inclusion of 20 percent animal protein supported excellent growth in chicks. With laying hens as good egg production was obtained on a ration containing both corn gluten meal and meat scrap protein as on one containing only meat scrap. The former was too low in vitamin G for optimum hatchability, but this deficiency was readily corrected by adding a small amount of milk products or alfalfa meal to the ration.

Practical supplements for soybean oil meal in chick rations, J. B. CHRISTIANSEN, H. J. DEOBALD, J. G. HALPIN, and E. B. HART. (Wis. Expt. Sta.). (*Poultry Sci., 19 (1940), No. 1, pp. 18–22*).—In a series of chick growth experiments involving lots of both White Leghorn and Barred Plymouth Rock chicks, the value of various commercial protein concentrates as supplements to chick rations, in which soybean oil meal furnished the main source of protein, was determined. Linseed oil meal and corn gluten meal at 5-percent levels failed to enhance the growth-promoting value of the ration. Fish meals of 3- or 4-percent levels proved to be very effective supplements, sardine meal ranking highest in growth-promoting value, followed in order by whitefish meal and menhaden fish meal. Dried skim milk was inferior to the fish meals but superior to either meat scrap or casein in this regard.

Studies on the nature of the effective supplements for soybean oil meal in rations for the production of hatching eggs, J. B. CHRISTIANSEN, J. G. HALPIN, and E. B. HART. (Wis. Expt. Sta.). (*Poultry Sci., 19 (1940), No. 1, pp. 55–60, fig. 1*).—In three separate experiments it was demonstrated that eggs produced by pullets receiving soybean oil meal as the principal source of protein had a low average percentage hatchability, mainly due to a severe fall in hatchability during the winter months. The addition of small amounts of crude casein to the soybean oil meal ration failed to increase the hatchability significantly, but the addition of flavin-bearing supplements, such as yeast, dried whey, or dried skim milk, consistently improved it. Similar favorable results were obtained by adding synthetic *d*-riboflavin to the diet, indicating that flavin was the effective factor in the above supplements. Manganese also proved an effective supplement in counteracting the winter slump in hatchability.

Simplified rations for the chick, A. G. HOGAN and L. R. RICHARDSON. (Mo. Expt. Sta.). (*Jour. Nutr., 19 (1940), No. 1, pp. 1–11, figs. 4*).—Continuing this series of investigations (E. S. R., 74, p. 834), it was demonstrated that when vitamins A, B_1, B_2, and D were otherwise provided in simplified rations for chicks then all the unrecognized vitamins required are supplied in the alcohol and water extracts of liver. By first extracting with alcohol and then with water a partial

separation of the unidentified essential factors was attained. Both extracts were required at relatively high levels to render the diet adequate. When these extracts were supplied at low levels the liver residue or hydrolyzed liver residue supplied some essential nutrient. Tikitiki was found to contain an essential factor, but this same factor was apparently present in even greater concentration in the alcohol-soluble fraction of liver.

The effect of restricted feed intake on egg weight, egg production, and body weight, B. W. Heywang. (U. S. D. A.). (*Poultry Sci., 19 (1940), No. 1, pp. 29-34*).—In two separate experiments conducted at the Southwest Poultry Experiment Station, Glendale, Ariz., the diet of pens of White Leghorn pullets was restricted to 75, 87.5, or 100 percent of that consumed by a group fed ad libitum. Restricting the dietary intake caused a decrease in the total average number of eggs produced, but did not affect the size of the eggs laid or the average weight of the fowl.

The protein requirements of White Leghorn pullets, J. S. Carver, V. Heiman, J. W. Cook, and J. L. St. John (*Washington Sta. Bul. 383 (1939), pp. 30, figs. 5*).—Duplicate pens of White Leghorn chicks were reared to 22 weeks of age at nine different levels of protein feeding. Cereals, alfalfa leaf meal, dried whey, and herring fish meal constituted the principal ingredients in all rations. Under plans 1 to 4 the chicks received 13, 15, 17, and 19 percent protein, respectively, throughout the growing period, while under plans 5 to 9 the chicks were started at either the 15, 17, or 19 percent levels and were reduced to lower levels at progressive ages. Pullets at the 19 percent level for from 1 to 3 or 1 to 6 weeks showed no advantage in body weight over those fed a 17 percent level at the end of 22 weeks. The groups started at the 13 or 15 percent level were considerably lighter in weight at 6 weeks of age and failed to overcome this disadvantage to 22 weeks of age. After the sixth week all the growth curves were nearly parallel. The average feed consumption of the groups fed the low level of protein was significantly lower during the first 6 weeks, but after this age there were no significant differences in the average feed consumption per bird. Up to 12 weeks of age all groups required about the same number of feed units per unit of gain, but from 12 to 22 weeks the groups fed the higher levels of protein required more feed per unit of gain. All groups showed the highest efficiency of feed utilization during the first 6 weeks, with a progressive decline in efficiency thereafter. The level of protein feeding during the growing period had little influence on pullets during the laying year with respect to gain in weight or final weight, mortality, rate of egg production, or initial and final albumin index and egg weight. It is concluded that the chick diet should contain approximately 17 percent of high-quality protein from 1 to 6 weeks, 15 percent from 7 to 12 weeks, and 13 percent from 13 weeks to maturity.

Choline in the diet of chickens, O. D. Abbott and C. U. DeMasters. (Fla. Expt. Sta.). (*Jour. Nutr., 19 (1940), No. 1, pp. 47-55*).—Employing a low-fat and low-lecithin basal diet composed of skim milk powder and alcohol-extracted polished rice supplemented with the necessary vitamins, it was found that the addition of choline to this basal diet for laying pullets increased egg production, decreased mortality, inhibited abortion of egg yolks, and materially decreased the percentage of fatty acids in the livers. Male birds showed a lower concentration of fatty acids in livers than pullets receiving corresponding rations, either with or without choline.

Biological assay of thiamin with chicks, T. H. Jukes and H. Heitman, Jr. (Univ. Calif.). (*Jour. Nutr., 19 (1940), No. 1, pp. 21-30, figs. 2*).—A method is described for the assay of thiamin with chicks, employing a basal diet of

polished rice, washed sardine meal, and autoclaved yeast, supplemented with minerals, fish oil, and a hexane extract of alfalfa meal. An assay period of 28 days was used. The estimated thiamin requirement of the chick was between 130 and 150 μg. of thiamin chloride hydrochloride per 100 gm. of diet. The polished rice used in the basal diet contained approximately 0.4 μg. of thiamin per gram. The polished rice contained an essential chick-growth factor not contained in autoclaved yeast.

The role of the antidermatosis vitamin and a new water-soluble growth factor in the nutrition of the mature fowl, J. C. Bauernfeind and L. C. Norris. (Cornell Univ.). (*Jour. Nutr., 18 (1939), No. 6, pp. 579–591*).—In a further report of this line of investigation (E. S. R., 81, pp. 409, 410), data are presented which essentially confirm earlier findings. An unidentified factor present in milk, liver, yeast, and fresh grass, when added to the heated diet in addition to the antidermatosis factor, permitted normal growth in chicks and satisfactory egg production in mature birds. However, this supplemented diet failed to promote normal reproduction or to maintain the weight of the hens. It was not determined whether these results were due to an insufficiency of the new factor or to a deficiency of another factor or factors.

Vitamin D products for poultry, C. S. Platt and W. C. Russell. (*New Jersey Stas. Hints to Poultrymen, 26 (1939), No. 6, pp. 4*).—Sources and levels of vitamin D for chicken and turkey feeding are discussed.

Occurrence of the pellagra-like syndrome in range chicks, H. C. Mason. (Univ. Ill.). (*Soc. Expt. Biol. and Med. Proc., 42 (1939), No. 2, pp. 609–611*).—This note summarizes the results of an investigation on the occurrence of a pellagra-like syndrome in range chicks maintained on a complex ration which was presumably adequate in all nutritive essentials. It appeared that the syndrome occurring in these range chicks was not significantly different from that observed experimentally in the laboratory. *B[acillus] coli* bacillosis was not a consistent finding among the affected birds. These findings suggest that the factors of nutrition and metabolic disturbances, when the preventive reserve is low, may play an important role in similar conditions in other range flocks.

The relation of production and egg weight to age in White Leghorn fowls, T. B. Clark. (W. Va. Expt. Sta.). (*Poultry Sci., 19 (1940), No. 1, pp. 61–66, fig. 1*).—The data presented in this report were obtained from a continuous record over a 10-yr. period for a group of White Leghorn hens maintained under constantly uniform conditions. Of the 200 hens entered in the test, 26 completed the tenth laying year. The decline in egg production was about 19 percent each year as compared with the preceding year. Mean egg weight was greater in the second year as compared with the first, remained at approximately the same level during the second and third years, and then decreased gradually to the tenth year. Significant changes in size occurred between the first and second, the fourth and fifth, and the seventh and eighth years. First-year production was not related to length of life, nor was the percentage change in production from the first to the second year.

The production of double yolked eggs in the fowl, R. M. Conrad and D. C. Warren. (Kans. Expt. Sta.). (*Poultry Sci., 19 (1940), No. 1, pp. 9–17, figs. 2*).—By classifying double-yolked eggs with reference to the distribution of pauses in laying before and after their production and also by yolk growth studies (E. S. R., 81, p. 637), it was deduced that about 65 percent of double-yolked eggs result from the simultaneous development and ovulation of two ova. In addition, about 25 percent result from the simultaneous ovulation of two ova which have developed in normal sequence, one of which would normally be ovulated a day later. The remaining 10 percent result either from the successive devel-

opment and simultaneous ovulation of two ova, one of which should normally have been released a day earlier, or from an ovum remaining in the body cavity for a day after ovulation and then being picked up by the oviduct along with the ovum released the following day.

The effect of air temperatures on egg shell thickness in the fowl, D. C. Warren and R. L. Schnepel. (Kans. Expt. Sta.). (*Poultry Sci., 19 (1940), No. 1, pp. 67–72, figs. 4*).—Laying hens and pullets held under controlled air temperatures and subjected to sudden temperature changes showed a marked reduction in eggshell thickness at a temperature of 90° F. This change in shell thickness was of the same order as the reduction in blood calcium content at high temperatures (E. S. R., 81, p. 828). High humidity tended to accentuate the depressing effect of high temperature on shell thickness. Feed consumption was markedly reduced when temperatures increased from 60° to 95°.

Methods of improving interior egg quality, L. A. Wilhelm. (Wash. Expt. Sta.). (*Poultry Sci., 19 (1940), No. 1, pp. 3–8*).—Eggs of known albumen index, selected on the basis of methods previously described (E. S. R., 77, p. 87), were used in this study. Comparable lots of eggs were (1) packed in standard cartons, (2) sealed in airtight containers under normal atmosphere, (3) sealed with air displaced by carbon dioxide, (4) sealed under vacuum pressure, and (5) sealed under vacuum-carbon dioxide release treatment. These packs were stored at temperatures of 30°, 50°, 70°, and 90° F., and the eggs were examined for interior quality after varying periods of storage. None of the treatments proved superior to the usual carton packaging for short-time holding at 30°. At higher temperatures packing in airtight containers effectively reduced quality loss. The use of carbon dioxide, while resulting in a turbid albumen, proved effective in preventing loss in interior quality even at high temperatures and also effectively prevented mold development, which occurred when eggs were sealed in normal atmosphere. Vacuum packing had little advantage over sealing in airtight containers and usually resulted in the adhering of the thick albumen to the shell membrane. The vacuum-carbon dioxide release method was not generally superior to storing in a carbon dioxide atmosphere.

Green rot in eggs, A. E. Platt and C. F. Anderson (*Jour. Dept. Agr. So. Austral., 42 (1939), No. 12, p. 1040, pl. 1*).—An unusual defect in eggs resulting from infection with a species of the genus *Pseudomonas* is described and illustrated in color.

Growth of turkeys.—I, Influence of strain, sex, and ration, V. S. Asmundson and I. M. Lerner. (Univ. Calif.). (*Poultry Sci., 19 (1940), No. 1, pp. 49–54, fig. 1*).—Poults produced from two strains of turkeys were used in this study. The poults, all hatched at the same time, were divided into two groups, each group comprising one-half the number from each strain. Group 1 received a 24.5-percent protein ration to 8 weeks of age and a 20-percent ration thereafter, while group 2 received a 20-percent protein ration to 8 weeks and a 17-percent one thereafter. Both groups received grain in addition to the mash ration after 16 weeks of age. The differences in protein level of the ration were found to have an important influence on growth of the body as a whole and on the muscles, bones, and gonads. A marked difference between sexes, not only with reference to gross body weight but also in the rate of growth of parts and in the relative rate of growth of bones and muscles, was found to exist. Differences between strains were relatively small, although significant, particularly with reference to length of leg bones and weight of bursa. Correlations between the growth of the different parts indicated that muscle growth was more closely correlated with body weight than were the bones. Also there was a greater association of the pectoralis major with the underlying keel than with the leg bones.

Weights and measurements of parts and organs of turkeys, S. J. Marsden. (U. S. D. A.). (*Poultry Sci., 19 (1940), No. 1, pp. 23–28, fig. 1*).—Based on measurements taken on 10 normal, fat, young Bronze roasting turkeys of each sex, data are presented on the gross weights and measurements of various body parts and organs.

Surface drying of frozen poultry during storage, W. H. Cook (*Food Res., 4 (1939), No. 4, pp. 407–418*).—A study at the National Research Laboratories, Ottawa, Canada, involved the storage of poultry for 83 weeks at temperatures of −13.5° and −22° C. at relative humidities ranging from 76 to 100 percent. Humidities less than about 95 percent at either temperature proved unsatisfactory, definite evidence of surface drying of the poultry occurring in from 2 to 3 mo. under these conditions. Humidities of from 98 to 100 percent resulted in no serious surface drying during the 83 weeks of storage. Humidities of between 95 and 98 percent permitted safe storage for periods of from 6 to 9 mo., less damage occurring at the lower temperature under comparable humidity conditions. Sealing the joints of the box liners proved beneficial in reducing surface drying regardless of the moisture permeability of the liner stock. Sealed, moisture-resistant liners, such as heavy waxed paper, were as effective for reducing surface drying as an unsealed impervious foil liner.

DAIRY FARMING—DAIRYING

Dairy science: Its principles and practice in production, management, and processing, W. E. Petersen (*Chicago: J. B. Lippincott Co., [1939], pp. VIII+679, figs. 112*).—This book, designed primarily as a text for college students, presents a comprehensive treatment of the field of dairy husbandry. The material, other than that dealing with specific production problems, is of a general nature, while the problems pertaining to production are dealt with more exhaustively. It comprises 53 chapters and an appendix, which includes tables on the composition and nutritive value of common feeds, questions pertaining to each chapter, and selected references to the literature.

Report of the Chief of the Bureau of Dairy Industry, 1939, O. E. Reed (*U. S. Dept. Agr., Bur. Dairy Indus. Rpt., 1939, pp. 46*).—Dairy cattle investigations at the Beltsville, Md., and field experiment stations for which results are briefly reported include breeding for high milk and butterfat production in purebred cattle, artificial insemination, methods for reducing calving mortality, mammary development in dairy heifers, the effect of injury or infection in the udder of heifers, characteristics of the freemartin condition in heifers, the viability of seeds in silage, improved methods of ensiling forages and tests with various types of temporary silos, losses in the field curing of hay, the improvement and utilization of pastures, the use of pastures and roughages as sole rations for milking cows, input as related to output in milk production, the relative palatability of different varieties of sweetclover, changes in the composition of pasture herbage during the grazing season, the use of shortwave diathermy in the treatment of mastitis, and various phases of the physiology of reproduction and lactation of cattle.

Reports of nutrition studies include the relation of vitamin E to nutritional paralysis, materials in plants affecting reproduction in mammals, the nature of the growth factor in casein and liver extract, carotene requirements for normal calving, the value of vitamin A supplements to poor-quality roughage, determination of the carotene content of cattle feeds, the use of mineral supplements in the ration of heifers, a simple ration for stock colony rabbits, and investigations of amino acids and proteins.

Investigations of dairy products as reported include various phases of the chemistry and bacteriology of milk; factors affecting the whipping properties of ice cream mixes; the preparation of low-lactose milk solids for use in ice cream; the preparation and use of casein fiber; the production of lactic acid and lactalbumin from whey; new food uses for whey byproducts; improved manufacturing and merchandising methods for Cheddar, Swiss, and foreign-type cheeses; a comparison of methods for evaluating the keeping quality of milk; the effect of homogenization, freezing, and other factors on the curd tension of milk and the relation of curd tension to digestibility of milk; and improved methods of detecting mastitis organisms in milk.

[Experiments with dairy cattle and dairy products in Illinois] (*Illinois Sta. Rpt. 1937, pp. 148–155, 156–160, figs. 5*).—Reports of dairy cattle investigations, by W. W. Yapp, A. F. Kuhlman, W. L. Gaines, C. S. Rhode, J. G. Cash, and W. B. Nevens, include a method of calculating transmitting indexes for dairy sires, the relation of color intensity of milk to total production, energy-size relationships in dairy cattle, the feeding value of soybean hay as affected by stage of maturity at harvest, and pasture improvement studies.

From dairy products investigations, by P. H. Tracy, M. J. Prucha, J. M. Brannon, O. R. Overman, and S. G. Menefee, results are noted on the bacterial content of commercial ice creams, the heat resistance of various strains of milk bacteria, the influence of improper cooling and dirty cans on milk quality, and the use of the photoelectric cell in determining the oxidation of butterfats.

[Experiments with dairy cattle and dairy products in South Dakota] (*South Dakota Sta. Rpt. 1939, pp. 25–32, fig. 1*).—Studies for which results are briefly noted include the comparative returns secured from sweetclover and Sudan grass pastures, and the influence of peppergrass on milk flavor, both by T. M. Olson; the relative digestibility and nutritive value of whole, medium-ground, and finely ground oats for dairy cows, by Olson and G. C. Wallis; the transmission of vitamin D from feed to milk, the influence of roughages on the vitamin D potency of milk, and the vitamin D requirements of dairy cows, all by Wallis; the reduction of weed flavors in cream, and the effect of various micro-organisms on butter, both by D. H. Jacobsen; and the rate of deterioration of cream during holding periods, by Jacobsen and C. C. Totman.

[Progress in dairy research] (*Univ. Reading, Natl. Inst. Res. Dairying, Ann. Rpts., 1937, pp. 17–71; 1938, pp. 19–83*).—A description of the research activities of the institute is presented, with brief summaries of 56 and 97 papers published during the respective years ended September 30, 1937, and September 30, 1938.

Expectation of life in dairy cows, C. Y. CANNON and E. N. HANSEN. (Iowa Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 12, pp. 1025–1032, fig. 1*).—From cow-testing-association records for 7 yr., information was obtained on the ages of 147,596 cows and the expectation of life at each age. These were found comparable to those of cows in the Iowa State College herd except for ages 2–3 and 3–4 yr. The cow-testing-association cows averaged approximately 4.7 yr. of age, and those in the Iowa State College herd 4.2 yr.

Live weight and milk-energy yield in Czechoslovak cows, W. L. GAINES. (Ill. Expt. Sta.). (*Jour. Dairy Sci., 23 (1940), No. 1, pp. 71–75, figs. 4*).—The author has analyzed data comprising 13,807 records of cows of three breeds and covering a wide range of size and age. Fitting these data to the equation, $FCM=bW^c$, where FCM is milk-energy yield in kilograms of 4-percent milk per year and W is the live weight of the cow in kilograms, the records as a whole give the equation $FCM=4.045\ W^{1.[illegible]}$. For the three breeds the exponent c was, respectively, 0.802, 0.85, and 1.368. For various age groups

within breeds, excluding groups of less than 100 records, the range of exponents was found to be from 0.5 to 1.62. It is concluded that these results support the equity of using milk-energy yield per unit live weight as a measure of dairy development among cows.

The influence of stable temperature on the production and feed requirements of dairy cows, J. R. DICE. (N. Dak. Agr. Col.). (*Jour. Dairy Sci.*, 23 (1940), *No. 1, pp. 61–69*).—A series of experiments covering several winter seasons was conducted to compare the milk production, feed consumption, and live weight changes among dairy cows housed in a warm barn and those sheltered in an open shed. In some instances the treatment of the groups was constant throughout the trial, while in other cases the double reversal method was employed. A summary of four trials indicates that cows running loose in open sheds (mean temperature 29.39° F.) produced slightly more 4-percent milk, consumed less total feed, and gained more in live weight than cows confined (in stanchions) in warm barns (mean temperature 50.64°). Nutrient consumption per 100 lb. of 4-percent milk produced was 9.83 and 9.37 lb. of digestible crude protein and 74.86 and 71.41 lb. of total digestible nutrients for the barn and shed cows, respectively.

Protein standards for milk production, J. MACKINTOSH (*Agr. Prog.* [*Agr. Ed. Assoc., Gt. Brit.*], *16* (*1939*), *No. 2, pp. 195–201*).—Summarizing the results of extensive feeding trials with milking cows comparing concentrate rations containing approximately 17 and 12 percent of protein, it was found that the condition of the cows, the level of milk production, and the composition of the milk were practically as good on the low level of protein intake as on the high one. It is concluded that when reasonably good roughage is fed the protein content of dairy rations may be reduced by about 30 percent below the conventional protein standard without detrimental effect on the condition of the cow and the yield or quality of milk.

The value of irrigated pastures for dairy cattle, H. P. EWALT and I. R. JONES (*Oregon Sta. Bul. 366* (*1939*), *pp. 25, figs. 8*).—Grazing trials extending over a period of 10 yr. gave evidence that it is profitable to establish and irrigate Ladino clover and grass pastures for dairy cows in the routine represented by these studies. A Ladino clover pasture established in the fall of 1927 and liberally fertilized provided profitable grazing over periods of from 153 to 183 days annually from 1929 to 1932, inclusive. An average of 6.75 irrigations per season was supplied. Stocked at the rate of 3.33 cows per acre this pasture furnished 47.7 percent of the total feed required by milking cows and yielded nutrients equivalent to 4.37 tons of alfalfa hay or 191 bu. of oats per acre. Four years' results with a mixed grass and Ladino clover pasture showed an average of 122.7 days of grazing for 2.9 cows per acre. The pasture provided from 65 to 80 percent of the total nutrients required by the cows and yielded nutrients equivalent to 4.8 tons of alfalfa hay or 226 bu. of oats per acre. Five years' results comparing the effect of fertilization on irrigated pastures showed an average yield from fertilized pastures equivalent to 6.4 tons of alfalfa hay per acre and from the unfertilized pasture 3.7 tons of alfalfa hay. The application of 300 lb. of 16 percent superphosphate gave yields practically equal to those resulting from the application of both phosphorus and nitrogen or a complete fertilizer.

Comparative value of Napier and Sudan grass when used as soiling crops for dairy cows, L. A. HENKE and G. W. H. GOO. (Hawaii Expt. Sta.). (*Jour. Dairy Sci.*, *22* (*1939*), *No. 12, pp. 1007–1010*).—In four double reversal feeding experiments, involving a total of 26 animals, green Sudan grass and green Napier grass were compared as soiling crops for milking cows. Each

of the green feeds was fed ad libitum in racks. Roughage consumption was 7.2 percent higher and milk production 8.7 percent higher on the Sudan grass ration. Butterfat tests averaged slightly higher when Napier grass was fed. Analyses of the grasses indicated the Sudan grass to be higher in crude protein, nitrogen-free extract, and total nutrients than Napier grass. The greater palatability plus the higher nutritive value of the former accounts for its superiority in these experiments.

A study of the pH values of the ingesta of the bovine rumen, C. F. Monroe and A. E. Perkins. (Ohio Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 12, pp. 983–991, figs. 2*).—In this study of the pH values of the contents of the bovine rumen two dairy animals with permanent rumen fistulas were used. Samples of the rumen contents representing various types of rations were taken at different periods during the day and from six locations in the rumen. With cows on typical winter rations, the ingesta proved to be most alkaline just prior to the morning feeding. After feeding there was a pronounced drop in pH for a few hours, then a gradual trend toward alkalinity, reaching a peak just prior to the evening feeding. Cows on pasture did not show these fluctuations. Samples from various parts of the rumen varied considerably in pH shortly after feeding, but the variations were slight from 6 to 8 hr. after feeding. When such typical feeds as corn or A. I. V. silage, alfalfa hay, and grain were fed, pH values of ingesta averaged between 6.83 and 7.01. On pasture, the ingesta tended to be more acid. The rumen content of the group of cows slaughtered from 12 to 18 hr. after feeding showed an average pH of 7.34, which is similar to values obtained on living animals prior to the morning feeding.

Blood volume changes in the mammary gland, J. C. Shaw and W. E. Petersen. (Minn. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc., 42 (1939), No. 2, pp. 520–524*).—Quantitative data were obtained on the blood plasma changes occurring in the mammary gland based on arteriovenous differences in hemoglobin content. In undisturbed animals blood volume changes were relatively small, generally less than 1 percent, whereas in excited animals such changes were markedly higher, averaging 5.7 percent for a group of cows showing slight to marked excitation. It was further shown that arteriovenous differences of nondiffusible blood substances are markedly affected by blood volume changes and that these cannot be corrected for on the basis of observed changes in concentration.

Injury or infection in udders of heifers may terminate in blind quarters, W. W. Swett, C. A. Matthews, and R. R. Graves. (U. S. D. A.). (*Jour. Dairy Sci., 22 (1939), No. 12, pp. 993–1006, figs. 7*).—Case histories and photographs of udder sections of a number of dairy animals from the breeding herd at Beltsville, Md., are presented. From this information it is evident that injury and infection in the udders of calves or young heifers generally result in blind quarters. Occlusion of the outlet preventing the removal of milk rather than a cessation in the development of the gland tissue in the affected quarters was generally observed.

[Abstracts of dissertations on dairy products] (*Iowa State Col. Jour. Sci., 14 (1939), No. 1, pp. 3–7, 17–19, 32–34, 43–45*).—Abstracts of the following doctoral theses pertaining to dairy products are noted: Effects of Tomato Juice on Production of Flavor Contributants in Butter Cultures, by C. W. Abbott; Bacteriological Studies on Swiss-Type Cheese From Pasteurized Milk, by J. Babel; Relationship of *Achromobacter putrefaciens* to the Putrid Defect of Butter, by T. J. Claydon; Effect of Growth of Microorganisms on Acid Numbers of Fat in Cream and Butter, by E. L. Fouts; and A Classification of the Proteolytic Micrococci Isolated From Dairy Products, by H. H. Harned.

Microbic dissociation of lactic acid streptococci, O. OKULITCH (*Canad. Jour. Res., 17 (1939), No. 6, Sect. C, pp. 171–177, figs. 9*).—This contribution from the University of British Columbia presents evidence that strains of *Streptococcus lactis* and *S. cremoris* may be induced to undergo dissociative changes by growing them in the presence of glucose. The change from the S- to R-form was accompanied by loss of lactose-forming power. Cultural, colonial, and biochemical characters of the organisms at different stages of variation are described. Lithium chloride and phenol were without influence in this regard. It appeared that the organism must be in a susceptible condition before dissociation could be induced.

Color of Guernsey milk, O. F. GARRETT and J. D. COWLING. (N. J. Expt. Stas.). (*Guernsey Breeders' Jour., 57 (1940), No. 1, pp. 9, 21, 22, figs. 2*).—Data are graphically presented on the seasonal trend of the color of Guernsey milk under an ordinary feeding program and the extent to which good color may be maintained in winter milk by feeding high-quality grass silage. A milk color grading scheme based on the variation in lactochrometer units is proposed.

Mineral composition of colostral milk, O. F. GARRETT and O. R. OVERMAN. (Ill. Expt. Sta.). (*Jour. Dairy Sci., 23 (1940), No. 1, pp. 13–17*).—Data are reported on the gross composition and the mineral composition of the colostrum from one Holstein and one Ayrshire cow based on the analyses of samples taken at frequent intervals up to about 3 days after parturition and on one taken 10 or 11 days after parturition. The most significant trends in mineral composition were the relatively high concentrations of calcium, magnesium, sodium, phosphorus, and chlorine in colostrum during the early hours of lactation, but all declined rather rapidly to a fairly constant level as the milk approached normality. Potassium tended to be low at parturition but gradually increased to a constant level as the milk approached normality.

***Some factors affecting certain milk properties.*—III, Effect of roughages on ascorbic acid,** O. F. GARRETT, R. B. ARNOLD, and G. H. HARTMAN. (N. J. Expt. Stas.). (*Jour. Dairy Sci., 23 (1940), No. 1, pp. 47–52, fig. 1*).—Continuing this series of investigations (E. S. R., 82, p. 242), milk samples collected from cows receiving alternately beet pulp, corn silage, and molasses-grass silage as roughages were found to contain essentially the same initial concentration of ascorbic acid regardless of the type of roughage fed. Milk from individual cows varied considerably with reference to the stability of ascorbic acid in milk during storage, the loss in raw milk during 5 days' storage ranging from 22.55 to 50.83 percent. The feeding of molasses-grass silage had a greater stabilizing effect on the ascorbic acid in milk during storage than did either beet pulp or corn silage.

***The effect of commercial sterilization on the nutritive value of milk,* V–VII** (*Jour. Dairy Res. [London], 9 (1938), No. 2, pp. 185–207, figs. 4*).—Three additional reports in this series are noted (E. S. R., 79, p. 531).

V. *The effect of commercial sterilization on the vitamin C of milk*, K. M. Henry and S. K. Kon (pp. 185–187).—Vitamin C determinations (chemical method) on 15 samples each of raw and commercially sterilized milk from the same bulk gave evidence that about 43 percent of the original vitamin C content was destroyed by sterilization. Storage of the sterilized milk for a period of 4–6 weeks resulted in a further reduction, equivalent to about 30 percent.

VI. *Comparison of the total nutritive value of raw and commercially sterilized milks*, K. M. Henry, E. W. Ikin, and S. K. Kon (pp. 188–206).—The total nutritive value of raw and commercially sterilized milk was compared in five separate experiments. In paired-feeding experiments in which the two milks were supplemented only with minerals no differences were found in the growth performance of the rats. The sterilized milk was consumed more readily than the raw

milk. When the milks were fed as the supplement to a mixed basal diet, those receiving raw milk grew better than those on sterilized milk. The addition of 5 percent of brewers' yeast to the above basal diet resulted in equal gains for the two lots. When 15 gm. of cane sugar per 100 cc. of milk was added, rats on raw milk grew better than those receiving an equal quantity of similarly treated sterilized milk, and when 30 gm. of cane sugar per 100 cc. was added those on raw milk continued to thrive, while those on sterilized milk consumed much less, grew poorly, and some developed symptoms of beriberi. Apparently vitamin B_1 became the first limiting factor in sterilized milk.

VII. *Conclusions*, S. K. Kon (p. 207).—It is concluded that from the nutritive standpoint sterilized milk is definitely inferior to raw or pasteurized milk.

The relationship between the cooked flavor and peroxidase reactions in milk, skimmilk, and cream, I. A. Gould. (Mich. State Col.). (*Jour Dairy Sci., 23 (1940), No. 1, pp. 37–46*).—A further report of these investigations (E. S. R., 81, p. 565) presents evidence of a close relationship between the temperatures at which cooked flavor appears in whole milk and those at which peroxidase is inactivated. With skim milk, higher temperatures were required to produce cooked flavor than with whole milk, although peroxidase inactivation occurred within the same temperature range in each case. With cream, there was no apparent relationship between the temperatures causing cooked flavor and those causing a negative peroxidase reaction. The addition of sodium or ammonium sulfite or glutathione in amounts sufficient to produce intense cooked flavor did not appreciably affect the peroxidase reaction or the Eh of the milk. However, the addition of hydrogen sulfide greatly affected the oxidation of the peroxidase reagents and markedly lowered the Eh of the milk.

Cooked and oxidized flavors of milk as affected by ferrous iron, I. A. Gould. (Mich. Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 12, pp. 1017–1023, figs. 3*).—In a further report of these investigations (E. S. R., 81, p. 565), it is shown that heating milk momentarily to from 80° to 82° C. or above prevents the development of oxidized flavor induced by the addition of ferrous iron. Results were the same whether iron was added before or after the heat treatment. The appearance of a strong cooked flavor at this temperature, due to the liberation of sulfides, is correlated with the failure of the oxidized flavors to develop. The critical temperature of milk containing added ferrous iron is higher than for that containing added copper. Apparently the lower temperatures are not sufficient to create a reducing system capable of hindering these oxidative changes, at least within the range of iron concentrations used in these trials.

Preventing development of oxidized flavor in milk, E. O. Anderson. (Univ. Conn.). (*Milk Dealer, 29 (1939), No. 3, pp. 32, 82*).—Trials conducted by the author indicated that the addition of a small amount of pancreatic enzyme to milk effectively prevented the development of oxidized flavor. Case histories are presented for a number of dairy plants in the State which have adopted this practice with uniformly good results.

Dairymen can reduce incidence of oxidized flavor by feeding cows rations which contain adequate amounts of carotene, J. L. Henderson. (Univ. Calif.). (*Milk Plant Mo., 28 (1939), No. 12, pp. 26, 27*).—A brief review of the relation of the carotene content of dairy rations to the development of oxidized flavor in milk. Eighteen references are cited.

Cereal flours as antioxidants in dairy products, W. S. Mueller and M. J. Mack. (Mass. Expt. Sta.). (*Food Res., 4 (1939), No. 4, pp. 401–405*).—Tests were conducted to compare the relative efficiency of various cereal flours (0.25 percent concentration) in protecting against copper-induced oxidized flavor

in whole milk. Finely milled oat flour, whole oat flour, and corn flour had similar antioxidative properties, each giving a high degree of protection against oxidized flavor development. Wheat (bleached or whole), barley, rye, and rice flours possessed but little antioxidative value. There was no direct correlation between the solubility of the cereal flours and their antioxidative action in milk. Corn flour when used in ice cream had antioxidative properties similar to those of oat flour (E. S. R., 78, p. 693), but was somewhat the more effective as a stabilizer.

Bacterial growth in milk as a possible source of error in the phosphatase test, H. W. Leahy, L. A. Sandholzer, and M. R. Woodside (*Jour. Bact., 38 (1939), No. 6, p. 683*).—This note from the University of Rochester indicates that under certain conditions various strains of bacteria may produce phosphatase or other compounds resulting in a false phosphatase reaction when this test is applied to milk. It is suggested that phosphatase tests used on milks having microscopic counts higher than 8,000,000 per cubic centimeter, or standard plate counts higher than 2,000,000 per cubic centimeter, should be interpreted with caution.

Correlation between grades on scores and grades on criticisms in the judging of dairy products, G. M. Trout, W. White, P. A. Downs, M. J. Mack, and E. L. Fouts (*Jour. Dairy Sci., 23 (1940), No. 1, pp. 1–12, figs. 5*).—This report by the committee of the American Dairy Science Association on judging of dairy products presents the results of a statistical analysis of the grades on scores and on criticisms of 483 contestant-sample judgments each for butter, cheese, milk, and ice cream. Correlation coefficients between all contestant grades on scores and their grades on criticisms in judging butter, cheese, milk, and ice cream and of all products were 0.3064, 0.8214, 0.3193, 0.4456, and 0.2354, respectively. All were statistically significant. Observed differences indicated that the judge who can score reliably may not be able to criticize accurately, but that the judge who can criticize reliably may be able to score reliably as well. Other data are presented to indicate that the abilities to score and to criticize are not closely similar.

Accuracy of methods of sampling milk deliveries at milk plants, P. H. Tracy and S. L. Tuckey (*Illinois Sta. Bul. 459 (1939), pp. 45–84, figs. 5*).—A study of the sampling procedure followed in four local milk plants, in which comparisons were made between the daily tests on fresh milk samples, weekly tests on laboratory composites, and weekly tests on plant composites and also between laboratory tests and plant tests on the plant composites led to the following conclusions: Inaccurate tests may result from improper mixing of the milk when dumped in the weigh tanks; milk samples obtained from the forward end of the tanks before mixing averaged considerably lower in test than those obtained from the rear end of the tank; plant composite samples generally averaged lower in test than the laboratory composite samples, probably due to variations from the accepted practice in the care of the plant samples; and tests on composite samples properly taken and kept gave an accurate measure of the fat content of the milk. Rather wide variations in the daily tests were observed, indicating that periodic testing would not be satisfactory for estimating fat contents under the conditions prevailing in this market. A comparison of composite samples taken in aliquot and those taken with a dipper indicated that aliquot sampling is not necessary for practical purposes.

Milk hygiene in the United States, W. Giltner. (Mich. State Col.). (*Vet. Med., 34 (1939), No. 6, pp. 346–351*).—A general discussion of the problem.

Milk hygiene in Great Britain, B. de Vine (*Vet. Med., 34 (1939), No. 6, pp. 352, 353*).—A brief résumé.

Twenty-fifth annual report of the creamery license division, T. H. BINNEY (*Indiana Sta. Cir. 251 (1939), pp. 16*).—This is the usual report (E. S. R., 80, p. 537) of the number of creamery licenses issued and testers examined and licensed during the year ended March 31, 1939. The licensed dairy manufacturing plants in the State on October 1, 1939, are listed.

The use of sodium metaphosphate for the preparation of soft-curd milk, C. SCHWARTZ, K. K. JONES, T. W. MACK, and R. W. VANCE (*Jour. Dairy Sci., 23 (1940), No. 1, pp. 19–35, figs. 5*).—Tests on a series of raw milks indicated that the addition of from 30 to 52 mg. of sodium metaphosphate per 100 cc. of milk (average 41 mg.) prevented the formation of a curd when the milk was treated with a pepsin-hydrochloric acid coagulant. Pasteurization partially nullified the action of the metaphosphate so that about 75 mg. per 100 cc. were necessary to maintain zero curd tension in the heated milk. When additional calcium was added to milk, zero curd tension could be maintained by increasing the amount of metaphosphate. In vitro experiments indicated that the treated milk was more easily digested than untreated milk. Metabolism experiments with rats indicated that the addition of metaphosphate increased the absorption of calcium from milk and of iron from an iron-containing milk diet. The level of metaphosphate used was nontoxic, and the method is recommended as a simple procedure for producing soft-curd milk in the home or dairy.

Processing and handling of coffee and whipping cream, M. J. MACK. (Mass. State Col.). (*Milk Dealer, 29 (1939), No. 3, pp. 38, 46, 48*).—A general discussion of common defects of cream and their prevention.

Variability in physical properties of Wisconsin butter, K. G. WECKEL. (Univ. Wis.). (*Natl. Butter and Cheese Jour., 30 (1939), No. 12, pp. 63–65, figs. 6*).—Data are presented on the seasonal variation in the physical properties of butters from a number of creameries in Wisconsin. Four measurements were applied to each sample, namely, melting point, resistance to crushing and to slicing, and rate of softening (sagging-beam test). The variation in the behavior of butters was significantly less in some creameries than in others for a similar period of time. It is suggested that the slicing test and sagging-beam test might be employed advantageously by creameries to measure the physical behavior of their products.

Foreign-type cheeses that should be more generally made and consumed in America (*New York State Sta. Cir. 187 (1939), pp. 27, figs. 34*).—A compilation of information from a series of articles previously noted (E. S. R., 75, pp. 250, 689; 76, p. 243; 77, pp. 243, 846; and 78, pp. 391, 693).

A comparison of gelatin and sodium alginate as stabilizers in ice cream, P. H. TRACY and S. L. TUCKEY. (Univ. Ill.). (*Food Res., 4 (1939), No. 4, pp. 335–347*).—A series of tests comparing sodium alginate and gelatin indicated that the relative efficiency of these two stabilizers, as measured by their effect on the whipping qualities of the mix and the body of the ice cream, varies with the conditions of the comparison, the mineral content of the mix and the kind of freezer used being especially important in this regard. With mixes containing 12 percent butterfat, 0.3 percent sodium alginate gave good results, comparing favorably with those obtained by using 0.35 percent of a 225 Bloom gelatin. Sodium alginate caused a lowering of the percentage of titratable acidity and an increase in pH. Ice creams containing sodium alginate melted more rapidly at room temperature and had a smoother appearance than those containing gelatin. No differences in flavor due to the stabilizer were detectable. Mixing the sodium alginate with the dry sugar or dispersing it in water and adding it to the mix at pasteurization temperature just prior to homogenization proved to be the most practicable method of adding this material to the mix.

Sanitary quality of ice cream, F. E. Nelson, W. J. Caulfield, and W. H. Martin. (Kans. Expt. Sta.). (*Ice Cream Rev., 23 (1940), No. 6, pp. 44, 46, 48, 50, 54*).—Results of a sanitary survey of commercial ice creams, involving 315 samples, are summarized. All samples were subjected to the standard plate count, direct microscopic count, coliform count, and phosphatase test. A total of 31.1 percent of the samples, representing 30 percent of the total gallonage, contained less than 10,000 bacteria per cubic centimeter, while 26.6 percent of the samples, representing 15.4 percent of the total gallonage, exceeded the legal limit of 100,000 bacteria per cubic centimeter. The classification of the causes of high counts indicated unsatisfactory pasteurization to be prevalent in the highest count groups, while gross contamination was found to be responsible for a large part of the poor sanitary quality observed. The four tests employed indicated the causes of the high counts in most instances.

Curd tension of chocolate milk drinks, G. Hadary and H. H. Sommer. (Univ. Wis.). (*Milk Dealer, 29 (1939), No. 3, p. 42*).—A comparison was made of the curd tension of untreated whole milk and of pasteurized, cooled chocolate milk drinks prepared by adding 1 part of commercial chocolate sirup to 9 parts of milk and pasteurizing at 160° F. for 15 min. The untreated milk showed a curd tension of 33 gm., while chocolate drinks prepared from seven commercial chocolate sirups showed values of 3, 2, 2, 1, 14, 2, and 4 gm., respectively. While the reduction in curd tension was partially due to pasteurization, the main effect was due to the cocoa. The effect of sugar and suspending agents in this regard was negligible.

A comparison of the imperviousness of commonly used paper milk containers when in contact with contained liquids, R. B. Stoltz and T. V. Armstrong. (Ohio State Univ.). (*Milk Plant Mo., 28 (1939), No. 12, pp. 54–58*).—Five makes of paper containers were used, including two cone-shaped and one square-type made up and paraffined at the factory and one cone- and one square-type paraffined at the plant just prior to filling. All containers were examined after they were filled with liquid and subjected to various treatments for 72 hr. As indicated by absorbed dye spots and increasing weight, none of the containers were impervious. Average weight increases on the cone-shaped containers ranged from 0.11 to 0.55 gm. and of the square containers from 1.48 to 1.55 gm. Higher storage temperature tended to cause greater absorption by the containers. The additional dipping in paraffin reduced the absorption. Bottles filled with 40 percent cream were rendered less impervious than those filled with milk or skim milk.

VETERINARY MEDICINE

[Contributions on animal pathology and parasitology] (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. 751, pp. 465–485*).—Papers presented at the annual meeting of the American Veterinary Medical Association held at Memphis, Tenn., August 28 to September 1, 1939, abstracts of which are given, include: Modification of the Distemper Virus, by R. G. Green (pp. 465, 466); Lesions of Gossypol Poisoning in Dogs Fed Cottonseed Meal, by J. L. West (pp. 466, 467); Skin Lesions in Animals Accompanying Deficiencies in Vitamin B Complex, Particularly Vitamin B_6, by K. Unna (pp. 467, 468); Some Nervous Disturbances in Dogs, by J. W. Patton (p. 468); Vaccination of Dogs With Modified Distemper Virus, by R. G. Green and F. S. Swale (pp. 469, 470); Canine Coccidiosis, by F. X. Gassner (pp. 470, 471); Effects of Intravenous Injection of Certain Salts of Sodium, Calcium, and Potassium on Intestinal Tonus and Motility in the Dog, by E. A. Hewitt (pp. 471, 472); Streptococcic Infections in Dogs, by H. J. Stafseth (pp. 472, 473); Specific and Nonspecific Intestinal

Diseases of Swine, by F. M. Wilson (p. 473); Death Losses in New-Born Pigs, by L. P. Doyle (p. 473); A Blood Picture in Hog Cholera, by H. C. H. Kernkamp (pp. 473, 474); A Bacteriological Study of the Aerobic Flora Occurring in Pneumonic Lungs of Swine, by F. Thorp, Jr., and F. W. Tanner (pp. 474, 475); Anesthesia of Large Animals, by G. R. Fowler (p. 475); A Study of the Composition of Alveolar Air of Domestic Animals, by G. T. Edds (pp. 475, 476); Mineral Deficiencies—Clinical Picture, Treatment, and Prevention, by H. Schmidt (pp. 476, 477); So-called Hemorrhagic Septicemia, by W. A. Aitken (p. 477); Variable Factors in the Measurement of Red Cell Sedimentation, by R. E. Nichols (p. 478); Intravenous Medication, by W. R. Krill (pp. 478, 479); Behavior of *Brucella* Vaccine in Various Excipients in Animal Inoculations, by A. Eichhorn, C. K. Mingle, and F. M. Murdock (p. 479); Pneumonia in the Horse, by D. L. Proctor (pp. 479, 480); Susceptibility of Guinea Pigs to Equine Encephalomyelitis Virus Inoculated Through Various Routes, by C. F. Schlotthauer (p. 480); A Method for Correlating Serum Calcium, Phosphorus, and Protein Findings in the Clinical Study of Horse Blood, by A. H. Craige, Jr., and J. D. Gadd (pp. 480, 481); Incubating Hen's Egg as a Culture Medium for *Brucella abortus*, by H. J. Metzger (pp. 481, 482); Induced Bloat in Dairy Cows, by R. W. Dougherty (p. 482); A Systematic Survey of the Gastrointestinal Worm Parasitisms of Cattle, by D. W. Baker (p. 483); Diseases Incident to Fattening of Lambs, by N. J. Miller (pp. 483, 484); An Attempt to Produce Preparturient Paresis in Ewes, by H. S. Cameron and H. Goss (pp. 484, 485); and Studies on the Total Ketone Bodies, Sugar, and Calcium in the Blood of Nonpregnant Ewes, by J. Sampson, L. E. Boley, and R. Graham (p. 485).

[Control of diseases of livestock] (*U. S. Dept. Agr., Sec. Agr. Rpt., 1939, pp. 135–139, 146*).—The progress of control work by the U. S. Department of Agriculture with bovine tuberculosis and Bang's disease, advances in cattle tick eradication, studies of stock-poisoning plants and selenium and fluorine problems, and supervision of livestock trucking are reported.

[Work in animal pathology and parasitology by the Illinois Station], R. GRAHAM, C. A. BRANDLY, G. L. DUNLAP, J. SAMPSON, L. E. BOLEY, J. D. MIZELLE, E. ROBERTS, L. E. CARD, and J. M. SEVERENS (*Illinois Sta. Rpt. 1937, pp. 104–106, 127–129, 130–142, figs. 10*).—Reporting upon the activities of the year (E. S. R., 78, p. 246), reference is made to control work with Bang's disease in individual herds, intestinal parasites in horses, cornstalk disease of horses, pullorum disease, infectious bronchitis, experiments with virus vaccines, breeding for resistance to pullorum disease, studies of the nature of disease resistance in animals, the value of sanitation in the control of worms in poultry, and discovery of a new disease of ducks due to *Pfeifferella anatipestifer* (E. S. R., 79, p. 398).

[Work with livestock diseases and parasites by the South Dakota Station] (*South Dakota Sta. Rpt. 1939, pp. 33–36, figs. 2*).—The work of the year (E. S. R., 81, p. 273) reported upon includes a study of the properties and uses of oil of chenopodium and of chenopodium plants incorporated in feed mixtures for the treatment of worms in swine and sheep, by F. LeBlanc, T. Wright, and J. Watson; tests with bacterins as immunizing agents against hemorrhagic septicemia, by J. B. Taylor; and selenium poisoning or "alkali disease" studies, including the toxicity of selenium to animals and the proper use of seleniferous land, by A. L. Moxon and O. E. Olson.

[Studies in comparative pathology, etc., in Japan] (*Jap. Jour. Vet. Sci., 1 (1939), No. 4, pp. 349–447, pls. 6, figs. 6*).—Contributions here presented (E. S. R., 82, p. 250) are: Studies on the Ovaries of the Mare—I, The Anatomical In-

vestigation of the Ovarian Changes in Sexual Cycles, by S. Hosi (pp. 349–375, Eng. abs. pp. 374, 375); Studies on *Shigella equirulis* (*Bacterium pyosepticum*), I, by K. Hirato (pp. 376–412, Eng. abs. pp. 410–412); Blood Picture in Healthy Foals, With Special Reference to the Numerical Variation of Leucocytes, by S. Kikuti (pp. 413–425, Eng. abs. p. 425); and Experimental Researches on the Temperature of Japanese Military Horses, by K. Fukano (pp. 426–447, Eng. abs. pp. 445–447).

Oxytenia acerosa, a plant poisonous for live stock, F. THORP, JR., G. S. HARSHFIELD, L. W. DURRELL, and C. G. BARR. (Colo. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 754, p. 97*).—The poisonous nature of *O. acerosa*, which in past years has been the cause of loss of cattle in certain canyons of western Colorado, is said to have been demonstrated through experimentally feeding it to lambs and rabbits.

Hepatic cirrhosis of horses, swine, and cattle due to the ingestion of seeds of the tarweed (Amsinckia intermedia), E. C. MCCULLOCH. (Wash. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 754, pp. 5–17, 18, figs. 11*).—The toxicity of the seeds of the yellow burweed or yellow tarweed (*A. intermedia*) for horses, swine, and cattle has been demonstrated, this apparently being the first time any member of the family Boraginaceae has been shown to be poisonous. The seeds of this plant are responsible for enzootic hepatic cirrhosis, known as walking disease of horses and hard liver disease of swine and cattle, as it occurs in certain regions of the Pacific Northwest. Rabbits, rats, and chickens appear to be immune, and the data to date show sheep either to be immune or highly resistant. No treatment for enzootic hepatic cirrhosis is suggested. Prevention consists of avoiding feeds containing the seed of *A. intermedia*. The findings indicate that considerable amounts of the seed must be fed before the pathological changes are produced, and the epizootiology of the disease indicates that the seeds vary in toxicity during certain years.

The experimental production of hepatic cirrhosis by the seed of Amsinckia intermedia, E. C. MCCULLOCH. (Wash. Expt. Sta.). (*Science, 91 (1940), No. 2352, p. 95*).—This note relates to the investigation the details of which are noted above.

Infection and reinfection experiments with Bang's disease, B. H. EDGINGTON and C. R. DONHAM. (Ohio Expt. Sta.). (*Jour. Agr. Res. [U. S.], 59 (1939), No. 8, pp. 609–618*).—The experiments conducted, the results of which are presented in detail in six tables, relate to the effect of time of breeding and stage of gestation on the agglutinin response of animals exposed to *Brucella abortus*, the channels of entrance of the bacteria into the animal body, and the result of reinfection of animals. A total of 33 cattle in 6 groups having different breeding histories at the time of their experimental infection was used. Infections were produced in the following ways: By (1) introducing *B. abortus* organisms into the vagina, (2) instilling the organisms into the conjunctival sac, and (3) feeding grain mixed with suspensions of the bacteria. The results tend to show that it is not the method of administration nor the channel of entrance of *B. abortus* organisms, but rather the "status of the animal" at the time of exposure that determines what will happen insofar as the act of abortion is concerned. The term status of the animal refers to such variables as age, puberty, the presence or absence of pregnancy, and the duration of gestation. Infections were produced readily by each of the three methods of experimental exposure employed in these experiments. Reinfection exposures with virulent *B. abortus* organisms did not appear to cause definite and consistent alterations in the agglutinin content of the blood of previously exposed animals, nor did

they significantly interfere with the animals' capacity to carry their calves to maturity.

The value of the sodium dextro-tartrate fermentation test in the differentiation of Salmonella organisms, S. W. CHALLINOR and A. J. RHODES (*Jour. Hyg. [London], 39 (1939), No. 6, pp. 651–657*).—In the differentiation of *Salmonella* organisms, the authors confirmed the observations of H. C. Brown et al. (1924–25)[2] that *S. schottmuelleri* (*B. paratyphosus* B) fails to ferment, while *S. aertrycke* and food-poisoning organisms do ferment, sodium dextro-tartrate. By a slightly modified procedure provisional results are obtained 48 hr. sooner than when the technic of Brown and his associates is followed. The application of this test is of definite practical value in differentiating between *S. schottmuelleri* and other *Salmonella* strains in the group phase.

The treatment of extreme cases of "sniffles" in the rat with sulfapyridine, F. Y. BILLINGSLEA (*Science, 91 (1940), No. 2349, p. 19*).—Sulfapyridine (1 mg. per gram body weight) was used with much success in the treatment of so-called sniffles in the laboratory rat; sulfanilamide does little more than slow the progress of the disease in cases where the infection is more extreme and deep-seated.

A survey of tubercle-bacilli types and of type-diagnosis [trans. title], H. HOLTH (*Skand. Vet. Tidskr., 29 (1939), No. 11, pp. 1125–1143; Eng. abs., pp. 1142, 1143*).—In this discussion the author gives several examples of the manner in which one tubercle bacillus type can be transformed into another.

Reaction of variola vaccine virus to roentgen rays, J. W. GOWEN and A. M. LUCAS. (Iowa Expt. Sta.). (*Science, 90 (1939), No. 2348, pp. 621, 622, fig. 1*).

Correlation of the brom-thymol-blue test with the bacteriological findings in the diagnosis of mastitis, C. C. PALMER, J. C. KAKAVAS, and J. R. HAY. (Univ. Del.). (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 754, pp. 47–51*).—In work conducted, the results of which are detailed in five tables, the bromothymol blue test failed to indicate mastitis in 29.34 percent of milk samples from individual quarters which were positive upon bacteriological examination.

Methylene blue as an antidote for poisoning by oat hay and other plants containing nitrates, W. B. BRADLEY, H. F. EPPSON, and O. A. BEATH. (Wyo. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 754, pp. 41, 42*).—The report of several investigators on the use of methylene blue in combating the methemoglobinemia caused by sulfanilamide therapy led the authors to investigate the efficacy of this dye in counteracting the methemoglobinemia produced in cattle by the ingestion of nitrates. In this work, in which 10 head of cattle were used, 13 experiments were conducted. The results indicate that 2 gm. of methylene blue is sufficient adequately to protect an animal weighing up to 250 kg. (550 lb.) against the ingestion of 6.3 kg. (14 lb.) of plant material containing about 5 percent of KNO_3.

The clinical and experimental use of sulfanilamide, sulfapyridine, and allied compounds, P. H. LONG and E. A. BLISS (*New York: Macmillan Co., 1939, pp. VII+[2]+319, [figs.] 6*).—This comprehensive account is presented in eight chapters, with author and subject indexes, as follows: The historical aspects of sulfanilamide therapy (pp. 1–13); the chemotherapy of experimental bacterial infections (pp. 14–47); experimental toxicity and comparative pharmacology of sulfanilamide and allied compounds (pp. 48–84); the mode of action of sulfanilamide and its derivatives (pp. 85–146); the clinical use of sulfanilamide (pp. 147–227), sulfapyridine, the sulfanilyl sulfanilamides, and

[2] Jour. Hyg. [London], 23 (1924), No. 1, pp. 1–22, pls. 2.

benzylsulfanilamide (pp. 228–247); and prontosil and neoprontosil (pp. 248–265); and the clinical toxic manifestations of sulfanilamide and its derivatives (pp. 266–292). Each chapter is accompanied by a copious bibliography.

The anthelmintic efficiency of phenothiazine, H. McL. Gordon (*Austral. Vet. Jour., 15 (1939), No. 6, pp. 245–252*).—The experiments here reported have led to the conclusion that, while further work is required, there are clear indications that "(1) phenothiazine offers great promise for the successful treatment of oesophagostomiasis by drenching, (2) that by using a larger dose rate satisfactory results may be obtained without the necessity for insuring that the drug passes direct to the abomasum, [and] (3) phenothiazine is a very efficient anthelmintic against *Haemonchus contortus*."

The effect of certain drugs and mineral deficiencies on helminthiasis of ruminants, Karam Chand (*Indian Jour. Vet. Sci. and Anim. Husb., 9 (1939), No. 3, pp. 267–278, pl. 1*).—In the experiment reported various cheap anthelmintics were tested against haemonchosis and oesophagostomiasis in calves and sheep. The combination of copper sulfate with kamala proved to be the most effective, followed in efficiency by a combination of copper sulfate and sodium arsenite. Experimentation points to the probability that mineral deficiencies lower the resistance of animals to parasitic infestation.

The hydrogen ion concentration of vaginal secretions of cows, S. H. McNutt, L. H. Schwarte, and D. F. Eveleth. (Iowa State Col.). (*Cornell Vet., 29 (1939), No. 4, pp. 415–419, figs. 2*).—Data presented in this report are based on examinations of the vaginal secretions of eight virgin heifers and three cows. The pH determinations were made at frequent intervals over varying periods, generally covering one or more complete oestrous cycles. Cows in late pregnancy showed a variation between pH 7.0 and 8.8. After calving the range was similar, but averaged slightly lower. Shortly after the cows again became pregnant the pH averaged still lower, ranging between 6.0 and 7.0. During the initial series with the heifers, values ranged from pH 5.1 to 8.8, and in the second series from 6.2 to 7.7. In the third series, which included both normal and spayed heifers, the unspayed ones varied between pH 6.2 and 7.3, while the spayed ones varied between 6.25 and 7.1. Except for one case, all determinations were above neutral at the time of heat. The general trend of these results suggest that pH values of the cow's vagina is of small significance for diagnostic purposes in breeding diseases.

Physiological studies of induced and natural bloat in dairy cattle, R. W. Dougherty. (Oreg. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 754, pp. 43–46*).—The studies reported led to the following conclusions: "Gas absorption from the rumen is quite rapid; the greater the amount of rumenal mucosa exposed, the faster the rate of absorption. Carbon dioxide is absorbed from the rumen and produces marked symptoms upon the respiratory apparatus, relatively high pressures causing extreme dyspnea. An increase in intrarumenal pressure causes an increase in the rate of absorption of carbon dioxide and carbon monoxide from the rumen. Carbon monoxide, when present in the rumen in very low concentrations, will produce marked symptoms when the intrarumenal pressure is increased with other gases common to the rumen. The intrarumenal pressure in this case need not be extreme. Carbon monoxide was found in an appreciable amount in two experimental cows fed freshly cut Ladino clover."

The sensitization of cattle to mammalian tuberculin by an avirulent strain of avian tubercle bacillus, J. R. McCarter, E. G. Hastings, and B. A. Beach. (Univ. Wis.). (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 754, pp. 52–55*).—In the work reported, a culture of acidfast bacteria isolated from a cow which had

reacted to mammalian tuberculin was shown by its pathogenicity for chickens, rabbits, guinea pigs, and calves, by its cultural characteristics, and by the behavior of its tuberculin protein in precipitin tests to be an avirulent avian tubercle bacillus. The authors emphasize the fact that even though bovine tuberculosis is being rapidly eradicated, cattle will continue to react to tuberculin until avian tuberculosis is also eradicated. "The ratio of these nonspecific reactors sensitized by the avian tubercle bacillus to specific reactors sensitized by mammalian tubercle bacilli may be expected to continue to increase until a more concerted effort is made to eradicate the avian tuberculosis from the chickens and hogs in Wisconsin."

Black disease immunization, E. A. TUNNICLIFF. (Mont. Expt. Sta. et al.). (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 754, pp. 105, 106*).—The single vaccination with a 5 cc. dose of alum-precipitated toxoid immunizes sheep against *Clostridium novyi* toxin for at least 17 mo.

The value of phenothiazine in the treatment of oesophagostomiasis in sheep, F. H. S. ROBERTS (*Austral. Vet. Jour., 15 (1939), No. 6, pp. 237–244*).—It is concluded from tests with Thiox, a preparation containing 93 percent phenothiazine, on 73 lambs and 19 6-tooth wethers that it is a safe and effective anthelmintic against *Oesophagostomum columbianum*. "Satisfactory results may be secured (1) by using a dose rate of 0.15 gm. per pound body weight given immediately after previous stimulation with 2 cc. of 10-percent copper sulfate and following 24 hours' starvation, [and] (2) by employing a dose rate of 0.4 gm. per pound body weight given without copper sulfate or previous starvation. Some sheep respond very poorly to treatment, even when the higher dose rate is used (in these experiments about 15 percent). This resistance appears to be associated with (1) a tendency to constipation, (2) the quantity of ingesta in the colon at the time of treatment, and (3) the condition of the sheep. Phenothiazine is also very efficient against *Haemonchus contortus* but has no anthelmintic value against *Trichuris* spp."

Sporulation and viability of oöcysts of Eimeria arloingi from the domestic sheep, J. F. CHRISTENSEN. (U. S. D. A.) (*Jour. Agr. Res. [U. S.], 59 (1939), No. 7, pp. 527–534*).—Report is made of the results of sporulation and viability experiments with oocysts of *E. arloingi* from domestic sheep. Several facts of practical importance in the control of ovine coccidiosis were demonstrated. Oocysts of *E. arloingi* from the domestic sheep showed maximum sporulation at 20°–25° C. when isolated in 2 mm. of clean water or inside moist fecal pellets, the majority developing within 2 to 3 days. In similar cultures sporulation was slow at 0°–5° and failed to occur at 40°. Oocysts in putrefying fecal sediment failed to sporulate at 0°–5°, 20°–25°, or 40°. Some sporulation occurred before desiccation in oocysts inside pellets dried at 20°–25°. Oocysts remained viable for at least 10 mo. in fecal sediment, and moist pellets kept at 0°–5°. All were killed within 4 mo. in fecal sediment kept at 20°–25°, and within 4 days in clean water fecal sediment or moist pellets kept at 40°.

The efficiency of various concentrations of solutions of copper sulphate against Haemonchus contortus, H. McL. GORDON (*Austral. Vet. Jour., 15 (1939), No. 5, pp. 216–218*).—Report is made of the experimental treatment of haemonchosis in young sheep with copper sulfate. It was shown "that a 2-percent solution is efficient in a greater proportion of cases (81.2 percent) than a 0.5-percent solution (66.6 percent) or a 10-percent solution (29.4 percent), although the difference between 2-percent and 0.5-percent solutions is not statistically significant. A 0.5-percent solution was found to be efficient in a greater proportion of cases than a 10-percent solution. A very large or very small bulk of fluid per dose is undesirable, and it appears that when copper

ulfate is being used a 4-percent solution gives about optimum dose rates. It s necessary to study dose rates for certain classes of sheep, e. g., large, well-rown, crossbred 'fat' lamb types. In the use of copper sulfate it is possible hat the usually prescribed rates are insufficient for such sheep, while on the other hand these rates may be too great for small poorly grown Merino types."

Pulpy kidney disease in Oregon lambs (infectious entero-toxemia), J. N. Shaw, O. H. Muth, and L. Seghetti (*Oregon Sta. Bul. 367 (1939), pp. 17, figs. 6*).—Studies of an affection which for many years has caused heavy losses in the best lambs raised by sheep breeders of Curry County have led to the finding of the anaerobic bacterium *Clostridium perfringens* type D to be the cause. Similar losses due to this organism have been reported from Texas, England, Australia, and New Zealand. The sudden death resulting has prevented its successful treatment, but prevention by the use of antitoxins proved successful.

Brucella melitensis infection in the Maltese goat, J. B. Polding (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 754, pp. 30–35*).—The author finds that the Maltese goat is not unique in its resistance to *B. melitensis* infection. "The disease picture in this animal not only runs parallel to *Brucella* infections in other animals but also appears, under experimental conditions at least, to offer the most regular and vivid history of brucellosis yet reported." This view is considered justified, since goats are often found so severely infected that the milk becomes degenerate, a state unusual in other animals, and grave clinical symptoms, seldom reported in cattle, frequently arise.

Some studies on swine influenza, I, II, C. T. Rosenbusch. (Iowa State Col.). (*Iowa State Col. Jour. Sci., 14 (1939), No. 1, pp. 73–75*).—The first part of the work abstracted, which supplements that of Lewis and Shope in 1931 (E. S. R., 71, p. 250), relates to a comparative study of *Hemophilus influenzae suis* and *H. influenzae* (pp. 73, 74); the second considers the antibody response of swine to experimental swine influenza (pp. 74, 75).

Studies on eastern equine encephalomyelitis, IV, V, L. S. King (*Jour. Expt. Med., 71 (1940), No. 1, pp. 95–112, pls. 2*).—This contribution is continued (E. S. R., 81, p. 575) in two parts.

IV. *Infection in the mouse with fresh and fixed virus* (pp. 95–106).—A fresh strain of equine encephalomyelitis virus was found to be infectious for adult mice in high dilutions by all modes of peripheral inoculation. "A fixed strain has very limited invasive power when injected peripherally unless virus is placed in fairly close contact with nerve cell bodies, as in the intranasal or intraocular routes. For fixed virus the effectiveness of the mode of inoculation may be graded in the following descending order: Intracerebral, intraocular and intranasal, intravenous, intraperitoneal, intramuscular, [and] subcutaneous."

V. *Histopathology in the mouse* (pp. 107–111).—"In mice affected with equine encephalomyelitis, the first pathological disturbance in infant animals is an inflammatory reaction which is usually less pronounced in adult animals. A characteristic type of parenchymal damage appears to be independent of the inflammation. In such foci of injury there is initially a vacuolation of intercellular tissue. Neurones in such areas are at first intact, later show cytoplasmic changes, and finally nuclear alterations. Complete disintegration of tissue and all its elements may be the end result."

Botulism and encephalomyelitis in horses, F. Hare (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 754, pp. 101, 102*).

The etiology of helminth aneurysms and equine strongylosis [trans. title], C. Pinto and C. Proença (*Rev. Facuid. Med. Vet. São Paulo, 1 (1938), No. 1,*

pp. 19–42, pls. 9, figs. 12; Eng. abs., p. 39).—In an investigation of the aneurysms of horses the authors found last stage larvae of *Strongylus vulgaris* and a male specimen of *Trichonema goldi*, also in the last molt, in the coagula of an aneurysm of the great mesenteric artery of a horse in the Federal District of Brazil. An adult male of *T. goldi* was also found in the intestine of this animal. A focus of strongylosis (*S. edentatus*, *S. vulgaris*, and *S. equinus*) was observed in Irajá, Federal District. All of the 22 horses brought in from other localities in February 1936 became ill after having been on the infected area for some time, the first severe case of strongylosis having occurred at the end of March. These cases were accompanied by anemia, progressive inanition, and weakness of the posterior train, followed by death. A list is given of 61 references to the literature.

Erythrocyte sedimentation studies in dogs, B. T. Simms. (Oreg. Expt. Sta. et al.). (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 754, pp. 77–79, 80*).—In a limited number of tests conducted, the sedimentation rates with citrated blood from normal dogs were 1 to 4 mm. (0.039 to 0.157 in.) in 1 hr. Pregnant bitches usually, but not always, had rates considerably above the apparent normal. Dogs affected with canine distemper had rates much higher than the apparent normal. Rates were increased significantly in dogs with salmon poisoning.

Treatment with sulfanilamide of meningo-encephalitis associated with canine distemper, M. L. Morris and T. J. Murray. (Rutgers Univ. et al.). (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 754, pp. 80–86*).—A more detailed account (E. S. R., 81, p. 576) is given of the use of sulfanilamide in the treatment of meningoencephalitis, a common complication of canine distemper, the mortality of which is essentially 100 percent. Thirty animals affected with this disease were treated with sulfanilamide, with an estimated recovery of 93 percent. "Insofar as possible, the blood-sulfanilamide level was maintained at not less than 15 mg. percent. Sulfanilamide therapy alone is insufficient when other complications exist. In the blood of all infected dogs there was an increase in the percentage of segmented polymorphonuclear neutrophils and a decrease in the percentage of lymphocytes. With sulfanilamide therapy, the blood picture approaches normal as the disease is brought under control."

A mouse test for measuring the immunizing potency of antirabies vaccines, L. T. Webster (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 754, pp. 65–73, fig. 1*).—The author has found the mouse test to be a practical, reliable measure of the immunizing potency of prophylactic vaccines for dogs, and points out that this test has shown phenolized, single injection, canine vaccines to be lacking in immunizing potency. Further studies on the administration of chloroformized vaccines in larger amounts and by different routes, plus studies on still different types of vaccines, are in progress with a view to developing, if possible, an effective, specific method for the prophylactic immunization of animals against rabies.

Lesions of gossypol poisoning in the dog, J. L. West. (Ala. Polytech. Inst.). (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 754, pp. 74–76*).—Gossypol, the active principle of cottonseed meal, is shown to be toxic and lethal for dogs. It exhibits an endotheliotoxic action. Extensive lung edema is probably the immediate cause of death. Cottonseed meal in the amount of 27 percent by weight of the ration over a period of time is toxic and lethal for dogs.

Accidental canine thallotoxicosis and dangers of thallium used as a rodenticidal agent, C. P. Larson, W. N. Keller, and J. D. Manges (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. 751, pp. 486–489, figs. 2*).—Following a discussion of the symptomatology and pathology of lesions produced by thallotoxicosis,

a report is made of clinical and pathological observations of two cases. Noteworthy pathological alterations not mentioned in the literature on thallium poisoning included severe degeneration with necrosis of the hepatic parenchyma and myocardium and foci of recent softening, petechial hemorrhages, with perivascular cuffs of exudate in the brain. This latter condition might well be termed a "chemical encephalitis" due to thallium.

Chemical and immunological studies on the agent producing leukosis and sarcoma of fowls, E. A. KABAT and J. FURTH. (Cornell Univ.). (*Jour. Expt. Med., 71 (1940), No. 1, pp. 55–70*).—It has been found that the activity of the producing sarcoma or leucosis "in material deposited by high speed centrifugation is the same as that of the original crude extracts. Material sedimentable at high speed containing approximately 10^{-3} mg. N produces tumors at the site of injection. Small quantities of material sedimentable at high speed are present in normal chicken sera, and about twice as much in leukemic sera (strain 1). Normal chicken and mouse spleens and all other human and mouse tissues examined contain large amounts of material sedimentable at high speed. Extraction of leukemic blood cells with saline yields little additional virus. The washed cells readily produce leucosis even after irradiation with amounts of X-rays sufficient to destroy the leukemic cells but not the virus. Freezing at −60° C. preserves the activity of the high speed deposits for at least 6 mo. Addition of 5 percent of saturated Na_2SO_4 solution slightly delays deterioration of high speed deposits in the ice box. Most of the agent measured by inoculation of chickens and the fraction sedimentable at high speed measured by its nitrogen content is precipitated by one-third saturation with sodium sulfate."

Experimental treatment of helminth parasitic infection of poultry with colloidal iodine or iodine vermicide, S. K. ACHARYA (*Indian Vet. Jour., 16 (1939), No. 2, pp. 83–93*).—In experiments conducted on 70 birds with gross helminthic infection, colloidal iodine or iodine vermicide was found to be 89.4 percent effective against nematodes and cestodes.

Coccidiosis in chickens and other birds, A. J. DURANT and H. C. McDOUGLE (*Missouri Sta. Bul. 411 (1939), pp. 12, figs. 5*).—A revision of Bulletin 372 (E. S. R., 77, p. 99).

The metacercaria of Amphimerus elongatus Gower (Trematoda: Opisthorchiidae), F. G. WALLACE (Univ. Minn.). (*Jour. Parasitol., 25 (1939), No. 6, pp. 491–494, figs. 2*).—This contribution includes an account of experimental infections of chickens and ducks in Minnesota with *A. elongatus*.

No blackhead loss in second year of turkey test, G. R. SIPE (*Miss. Farm Res. [Mississippi Sta.], 2 (1939), No. 12, p. 8*).—Brief reference is made to the continuation of tobacco dust control work with blackhead in turkeys (E. S. R., 82, p. 393). Through the indirect control resulting from destruction of ceca worms, the eggs of which serve as hosts for the causative organism, all loss from this source was prevented. At the age of 28 weeks, 41 hens and 23 toms averaged 11.3 lb. each. The freedom from loss in the lot not receiving tobacco dust is attributed to the fact that for the past 8 yr. all chickens raised had received tobacco dust.

The occurrence of erysipelas in turkeys, C. F. SCHLOTTHAUER and L. THOMPSON (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 754, pp. 103, 104*).—A report is made of the occurrence of swine erysipelas in a flock of turkeys in Minnesota.

A note on Echinoparyphium recurvatum (von Linstow), parasitic in California turkeys, R. F. ANNEREAUX (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 754, pp. 62–64, fig. 1*).—Report is made of the parasitism of a turkey by the fluke *E. recurvatum*, the first to be recorded for this host. A description of the fluke and notes on its occurrence in ducks, chickens, and grebes are included.

Field studies on coccidiosis in the ring-neck pheasants of eastern Washington, R. A. Ormsbee (*Parasitology, 31 (1939), No. 3, pp. 389–399, pl. 1*).—In observations of the ring-necked pheasant in Whitman County, Wash., 3 and possibly 4 species of *Eimeria* were found present, namely, *E. phasiani*, *E. pacifica* n. sp., *E. megalostomata* n. sp., and one referred to as type 4. An average incidence of infection of 38 percent was found in 37 pheasants over a period of 7 mo. "There was a drop in the incidence from 70 percent in October to 30 percent in November. The incidence remained at 30 percent during February and March and jumped to 67 percent in April. . . . All infections observed were light. Histopathological studies showed little damage to the intestine, and there was no significant difference between the weights of infected and noninfected birds. Oocysts of *E. pacifica* sporulated at temperatures from 8° to 30.5° C. The latter is the optimum temperature. Intracellular organization prior to sporulation was indicated in oocysts of *E. pacifica* kept at 8°. A temperature of 37.5° was lethal to oocysts of *E. pacifica*. Degenerative changes in the oocysts were first observed 9 days after being placed at that temperature." A list of 30 references to the literature is included.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations of the Bureau of Agricultural Chemistry and Engineering] (*U. S. Dept. Agr., Bur. Agr. Chem. and Engin. Rpt., 1939, pp. 63–89*).—These have included chemical engineering research on agricultural fires and dust explosions; farm-structures research on farmhouse design and insulation, storage of potatoes, corn, wheat, and grain sorghum, silage pressures, and orchard heaters; pest-control machines and equipment, including a trash-covering attachment, wheelbarrow power sprayers, performance of dust nozzles, the steam-vapor method of applying sulfur fungicides, soil and manure sterilization, and electricity as a weed killer; fertilizer-distributing machinery; machines used in the production of sugar beets, corn, sweetpotatoes, and silage crops; tillage machinery, especially plows and cotton planters and cultivators; cotton ginning and fiber-flax processing; farm-operating efficiency studies; and rural electrification.

[Agricultural engineering investigations by the Illinois station]. (Partly coop. U. S. D. A. et al.). (*Illinois Sta. Rpt. 1937, pp. 236–262, figs. 5*).—The following captions indicate the scope of this work: Studies indicate rural use of electric power, by E. W. Lehmann and A. L. Young; weather influences proper operation of septic tanks, by Lehmann and A. M. Buswell; light oils give better lubrication in gasoline tractors and rubber tires and high compression prove success on tractor, both by R. I. Shawl; terraces easily made and worth more than their cost, by Lehmann and R. C. Hay; small combines have relatively more threshing capacity, by Young, P. Bateman, and W. M. Hurst; best power and machines for soybean production studied, by H. P. Bateman and Lehmann; seed corn vitality increased by drying procedures, by Lehmann, R. H. Reed, W. L. Burlison, and G. H. Dungan; underground pipes may improve stationary spraying plant, by Lehmann, Reed, H. W. Anderson, and R. L. McMunn; some pipes withstand apple-washing solutions, by Reed; fuel gas from ground soybeans not feasible, by H. P. Rusk, Buswell, Lehmann, E. E. DeTurk, and L. J. Norton; four conclusions reached on grain storage problems, by W. Ashby, T. Cleaver, and Foster; and improved seed cleaning sought as aid in weed control, by Lehmann, C. W. Veach, and L. V. Sherwood.

[Agricultural engineering investigations by the South Dakota Station] (*South Dakota Sta. Rpt. 1939, pp. 49–51, fig. 1*).—This report contains notes on

experiments with rammed earth walls, with and without protective covering with plaster panels, for farm buildings, by R. L. Patty, H. M. Crothers, and H. H. DeLong; comparison of galvanized with painted steel fence posts, by Patty; use of rubber tires on farm vehicles, by DeLong; and hitches for tractors and large horse teams, by D. E. Wiant, Patty, and DeLong.

Surface water supply of the United States, 1938. Part 11, Pacific slope basins in California (*U. S. Geol. Survey, Water-Supply Paper 861 (1939), pp. VII+374, pl. 1*).—This report presents measurements of stream flow in these basins during the year ended September 30, 1938.

Summary of records of surface waters of Texas, 1898–1937, C. E. Ellsworth (*U. S. Geol. Survey, Water-Supply Paper 850 (1939), pp. VI+154*).—This paper brings together, in one volume, summaries of stream-flow records collected by the Geological Survey from 1889 to 1937 and brought together from more than 50 reports, of which many are now out of print, together with some records not heretofore published. Records from stations on the Rio Grande and on certain of its tributaries, published in reports of the International Boundary Commission, are omitted from the present compilation.

Geology and ground-water hydrology of the Mokelumne area, California, A. M. Piper, H. S. Gale, H. E. Thomas, and T. W. Robinson (*U. S. Geol. Survey, Water-Supply Paper 780 (1939), pp. VII+230, pls. 22, figs. 28*).—The Mokelumne area has been intensively developed for the cultivation of crops, its great productiveness being maintained by irrigation. The specific question investigated was the extent to which the supply of ground water is dependent upon the water flowing in the Mokelumne River and the extent to which productiveness may be influenced by regulation of the stream—in particular, by the substantial regulation of the river that is accomplished by the Pardee Dam of the East Bay Municipal Utility District, which began to function in March 1929.

It is concluded that "diverting water out of the Mokelumne River Basin at the Pardee Dam does not necessarily entail a diminution in ground-water replenishment by seepage loss along the lower reach of the stream, at least in the replenishment beneath the Victor plain above the gaging station at Woodbridge. Rather, the Pardee Dam affords a means for so regulating the discharge as to effect a maximum ground-water replenishment with a given run-off in the natural channel."

Water levels and artesian pressure in observation wells in the United States in 1938, O. E. Meinzer and L. K. Wenzel (*U. S. Geol. Survey, Water-Supply Paper 845 (1939), pp. IV+724, figs. 9*).—This report is the fourth of an annual series on ground-water levels and artesian pressures (E. S. R., 80, p. 830). The present report gives records of water levels or artesian pressures in observation wells in 32 States and the Territory of Hawaii obtained by the Geological Survey and cooperating Federal, State, Territorial, county, and local agencies. Complete records of water levels in some wells not heretofore published are also given, including those for years prior to 1938.

Report of the Chief of the Bureau of Public Roads, 1939, T. H. MacDonald (*U. S. Dept. Agr., Bur. Pub. Roads Rpt., 1939, pp. 85*).—This report, the last from the Department of Agriculture (E. S. R., 81, p. 753), contains, among others, discussions of future highway needs; the Bureau recommendation against a system of toll highways; highway safety; progress in proportioning the physical dimensions of highways; roadside improvement; diversion of highway funds; use of Federal aid in freeing toll bridges on the Federal-aid system; sources of funds used during the year; employment on road work; mileage of Federal-aid system; status of major funds and progress in con-

struction; inter-American highway; transportation, economic, and statistical investigations; and physical research, including the measurement of road-surface roughness, an erosion test for coated culvert pipe, the structural design of concrete and nonrigid pavements, the lack of durability of portland cement, and related topics.

Engineering manual.—Sect. 1, Job planning and estimating in land development, T. B. Chambers (*U. S. Dept. Agr., Soil Conserv. Serv., 1939, SCS-EP-16, pp. 39*).—This manual contains instructions, methods, and data for planning and organizing construction on Soil Conservation Service and land-use development projects and for estimating costs, most of the data applying to such works as buildings, dams, roads, bridges, water supply, and sanitary systems. These data have been prepared primarily to facilitate job planning but "may also be valuable reference material for the preliminary estimating required in connection with preparing initial project development plans and current work programs or revisions thereof."

The glued laminated wooden arch, T. R. C. Wilson. (Coop. Univ. Wis.). (*U. S. Dept. Agr., Tech. Bul. 691 (1939), pp. 123, figs. 73*).—Wood has the necessary tensile and compressive strength and bending resistance, but its use in arches has been retarded because ribs of the necessary size and curvature can be formed only by assembling pieces sawed to shape or by superimposing bent layers or laminae. In the first type the assembly is weakened by the necessary joints and by nonparallelism of wood fibers to the axis; in the second, available mechanical connections such as nails, screws, bolts, or dowels permit sliding of one lamina on another, and the assembly of laminations does not act as a unit. Efficient laminated wooden arch ribs and other members are now made available, however, through the use of glues of proven durability to bond laminae together as a unit so that resistance to sliding or shear is as great between the layers as within the wood itself.

This bulletin discusses recent research on the strength of glued laminated construction conducted at the Forest Products Laboratory and presents recommendations for specifications and design stresses, together with other information for engineers, architects, and builders. Much of the information applies to other structural members, such as straight, cambered, or curved beams and curved chords for trusses, as well as to arches. Framework arches are not considered, however. The extensive European experience is discussed.

In all curved glued laminated structural members considered in this bulletin thickness of laminations is so adjusted to the curvature that steaming or other softening treatment as used in bending wood for other purposes is not required, and bending and gluing are done in one operation. Straight glued laminal structural members are also taken up.

AGRICULTURAL ECONOMICS

[Problems in agricultural economics and rural sociology] (*U. S. Dept. Agr., Sec. Agr. Rpt., 1939, pp. 1–122*).—In this report the Secretary suggests that the war is no reason for abandoning our efforts of conservation, adjustment, and planning and the establishment of a rural-urban balance on the basis of equitable price relationships. Agricultural adjustment would take care of future needs for expansion as well as curtailment. The war situation tends to widen the economic gulf between the New and the Old World and beclouds a long-time trade prospect. The farm adjustment problem remains essentially unchanged. Attention is also called to the dangers of inflation. The ever-normal granary and changing currents in foreign trade are discussed, including reciprocal trade agreements and a need for world collaboration, particularly

with Latin America. In this connection the possibility of importing tropical products of the Western Hemisphere are considered.

Among other topics discussed are the Agricultural Adjustment Administration program for 1940; the dry-farming regions; marketing agreements, surplus removal, and the stamp plan; farm price and income policies; national income and rural-urban balance; progress and problems of farm technology; the public interest in land use planning; the human side of land use changes; aids to rural underprivileged; crop insurance; the cotton adjustment and export program; the situation with reference to various crops and farm livestock; farm credit; taxation; and Civilian Conservation Corps activities.

[Investigations in agricultural economics and farm management by the Illinois Station, 1936–37] (*Illinois Sta. Rpt. 1937, pp. 182–235, figs. 6*).—In addition to work previously noted, results are included and discussed as follows: (1) Tables, by H. C. M. Case and M. L. Mosher, summarize the records for 1936 for 217 farms enrolled in the Farm Bureau Farm Management Service in Livingston, McLean, Tazewell, and Woodford Counties, making comparison with the years 1927–35, inclusive, the location of some component differences making up the total differences between the incomes of the most profitable and the least profitable farms grouped according to the relative amounts of crops fed, and the effect of 10 years' use of legumes and livestock on corn yields; (2) tables, chart, and map, by P. E. Johnston, J. B. Cunningham, Case, and R. W. Bain, summarize by counties or groups of counties 1,658 farm account books for 1936, and data as to net income 1935 and 1936 by type-of-farming areas with comparisons with earlier periods; (3) tables and charts, by J. K. Lee, Case, and D. E. Lindstrom, show for the years 1926–35 the relative prices and cash balances from the farm business, farm expenditures, nonfarm expenditures, the percentages of expenditures for various classes of household goods by farm families in different income groups, and the percentages that food expenditures were of total expenditures in the different years ; (4) tables, by L. J. Norton and C. R. Sayre, based on farm accounts summarize for 1935 the purposes for which 1,055 Illinois farm operators borrowed funds, the sources of the funds, and security given for loans; (5) tables, by Case, R. H. Wilcox, and E. B. Colegrove, show by years 1922–33 the yields per acre and hours of man labor and horse and tractor work used per acre in producing corn in Champaign and Piatt Counties, and the cost of producing soybeans in the same counties by years 1930–35; (6) a table, by Case and J. Ackerman, presents a 10-yr. (1925–35) financial summary, by tenure classes, for selected farmers in four east-central counties of the State; (7) some findings, by G. L. Jordan, as to the effect of new agricultural policies on shifts of acreages of crops and numbers of livestock; (8) tables, by Johnston and J. E. Wills, show the changes in type of power used on Illinois farms 1930–35, and the combined man-labor, horse, and machinery costs per acre (1935 and average 1930–34) on horse, standard-tractor, and general-purpose-tractor farms of different sizes; (9) some findings are reported of a study, by C. L. Stewart, of numerical ratings for the productivity of fields; (10) tables, by R. C. Ashby and J. L. Liles, show the relationship of miles operated to costs in 1936 for 15 trucks, the costs for different items, the relative importance of commodities hauled, and the charges per ton-mile for the different commodities; (11) some general findings, by Ashby, in cooperation with the Farm Credit Administration, in a study of Illinois livestock auctions; (12) tables, by Wilcox, Colegrove, and L. E. Card, show the investment, receipts, expenses, and earnings of the poultry enterprise on 63 farms in 1936, the effect of hen mortality on costs and returns, and the cost of growing pullets to laying age; (13) findings, by Johnston and V. W. Kelley, as to returns from fruit raising on 37 farms in

1936, include a table showing cost of growing and producing apples; (14) recommendations for strengthening the western Illinois apple industry, based on a study by S. W. Decker in cooperation with H. W. Mumford, Jr., of the Farm Credit Administration; (15) some findings, by R. W. Bartlett and A. J. Brown, in a study of the effects of premium payments on the improvement of the quality of cream and butter, and, by Bartlett, of store and depot distribution of milk, including a table showing costs per quart for distributing milk through milk depots in Danville, Ill., January 1937; and (16) tables, by Wilcox, Bain, C. S. Rhode, and J. G. Cash, show the relations of production per cow to cost per 100 lb. of milk and of production and feed cost per cow to feed cost per 100 lb. of milk.

Current Farm Economics, [October–December 1939] (*Oklahoma Sta., Cur. Farm Econ., 12 (1939), No. 5–6, pp. 119–156, figs. 5*).—Included are a discussion of the agricultural outlook for 1940 by the staff of the station and extension division (pp. 122–136) and articles on A Study of Negro Farming in the Boley Area of Oklahoma, by P. Nelson and E. T. Etter (pp. 136–140), based on records of 1938 operations on 14 owner-operated and 37 tenant-operated farms; Cooperative Principles Found in Oklahoma Cooperative Laws, by A. L. Larson (pp. 140–145); and Sidelights on the Oklahoma Farm Mortgage Problem, by G. P. Collins (pp. 145–153). The usual tables of indexes of prices, demand deposits, and purchasing power of Oklahoma agricultural products are brought down through October or November.

Agricultural outlook for Illinois, 1940 (*Illinois Sta. Cir. 500 (1939), pp. 32, figs. 16*).—The general agricultural situation and the outlook for feed grains, other feeds, wheat, broomcorn, soybeans, forage crop seeds, livestock and livestock products, dairying, fruits, vegetables, and forestry are discussed.

Effect of industrial development on agriculture, C. E. Allred and J. P. Burnett (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 97 (1939), pp. [2]+47, figs. 18*).—Tables are included and discussed presenting data showing the effect of industrial development on size of farms, land values, changes in type of farming, value of farm machinery, number and price of purebred livestock, acreage of alfalfa, liming practices, crop yields, landownership, tenancy, hired labor, wages, farm structures, idle land, markets, part-time farming, cooperative sales and purchases, etc.

Land use adjustment in the Spring Creek area, Campbell County, Wyoming, R. L. Spurlock and S. M. Lingo (*U. S. Dept. Agr., Soil Conserv. Serv., [1939], pp. [1]+15, figs. 6*).—"The purpose of this publication is to show in graphic form how a typical Plains area, formerly distressed by a complex of land-use problems, is being placed on an economically sound basis of operation." The six maps included show the land utilization project areas in Wyoming, landownership in the Spring Creek area in 1934 (before changes in land use) and in 1938 (after Government purchase), operating units in the 2 yr., and development work accomplished in 1938. A short section of the text gives certain basic background material and details not evident from the examination of the maps.

Forage production, its use and approximate costs in northeastern Nevada, C. E. Fleming and C. A. Brennen (*Nevada Sta. Bul. 150 (1939), pp. 21, figs. 3*).—The number of acres required per animal unit month and the cost per animal unit month for ranch forage—hay and aftermath, pastured hay lands, irrigated pasture, and dry pasture, and private range land and lands under public grazing privileges in National Forest and under the Division of Grazing of the U. S. Department of the Interior; leased and purchased forage costs; forage costs; the relationship of land costs, fence cost, and carrying capacity to forage

cost; forage use; etc., are discussed. The tabulations "include information from production cost studies, from reports of public agencies, from common knowledge, and from inquiry and discussion with stockmen. The figures and tables include averages and approximations, along with actual known data."

Cost and efficiency in producing hops in Oregon, G. W. Kuhlman and R. E. Fore (*Oregon Sta. Bul. 364 (1939), pp. 57, figs. 16*).—This study is based on 24 survey records for 1934, 79 for 1935, and 69 for 1936 taken from producers in the major hop-growing counties of the State. The records included 8,408 acres producing 7,211,855 lb. of dried hops. The hop acreages in the individual farms varied from 6 acres to several hundred acres, averaging 48.5 acres. In addition, records on the cost of establishing new plantings and trellises were obtained in 1934 for 60 additional yards aggregating 1,105 acres in the Willamette Valley. The situation in the hop industry in Oregon and the United States is described. An analysis is made of the capital investment of the 79 yards studied in 1935, the costs for the 3 yr. for labor, materials, equipment, general expense, depreciation, and interest; and major items of cost, cash and noncash costs, cost of drying hops, fixed and seasonal costs, and variation in costs are discussed. The major factors influencing costs and profits—yield per acre and factors affecting it, labor efficiency in production and harvest, size of business, and grade and price—are analyzed and discussed. An analysis is made of cash and noncash costs of establishing plantings in 1932–34. The situation and outlook for the hop industry in the State are discussed.

The average yields of dried hops per acre and costs per pound were 989 lb. and 17.15 ct. in 1934, 973 lb. and 16.85 ct. in 1935, and 706 lb. and 21.92 ct. in 1936. The averages for the 3 yr. were 889 lb. and 18.6 ct. The average prices received in the respective years were 18, 16, and 34 ct. per pound. The cost on 18 percent of the acreage studied was below 15 ct. and on 40 percent from 15 to 20 ct. The average total cash cost during the period was 13 ct. per pound. Of the average total costs labor comprised 57.1 percent, horse work 1.2, materials 11.8, equipment 5.4, general expenses 5.8, depreciation 8.2, and interest 10.5 percent. The average cash outlay per acre for hired and contract labor was $78, being 84 percent of the total man labor cost. In general, yield per acre was the most important factor affecting cost per pound, the average cost decreasing from 37.2 ct. with yields below 400 lb. per acre to 15.7 ct. with yields of from 1,000 to 1,200 lb., but 16.7 ct. with yields of 1,200 lb. or over.

"Medium-sized yards had the lowest cost of production, largely because the size of business was big enough to utilize equipment and labor economically, particularly in conjunction with a diversified farming system, yet not so large as to require high expense per acre for such items as supervision and various facilities for hired labor. The larger hop enterprises, usually located on bottom land, had the largest investment per acre in land and trellis, hop buildings, and machinery. Moreover, the large specialized hop grower more commonly performed all the routine practices, including spraying or dusting, regardless of the market price outlook."

Production, purchase, sale, and use of specified foods on Alabama farms, B. T. Inman (*Alabama Sta. Cir. 81 (1939), pp. 31, figs. 4*).—This study was made to determine the amounts of food products produced, purchased, and consumed on farms, and methods of improving the farm diet. Production and disposition reports of the U. S. D. A. Bureau of Agricultural Economics were used in computing the production and sales of the principal products and to some extent in computing home consumption. Records of 816 farms in various farm areas of the State were used in further itemizing the production and

disposition data of the Bureau, and as the basis for calculating family food purchases and the use of food by tenure groups. An analysis of 346 farm records taken in the Sandy and Buck Creek soil conservation area near Dadeville in 1934 was made to determine the number of months in which certain important fruits and vegetables were available for consumption. Tables are included and discussed showing the amount and value of field crops, livestock and livestock products, vegetables, fruits, and nuts sold and used by farmers in 1935; the amount and value of processed field crops, livestock products, fish, vegetables, fruits, and nuts purchased by the farmers in 1935; and the amount and value of different products produced on the farm or purchased and consumed per farm person. Other tables show the variations in values of food consumed by areas and by tenure, and charts show the months in which fruits and vegetables were available for consumption in the Sandy and Buck Creek conservation area.

"The foods consumed per farm person that were produced or were adapted to some extent to production in the State, 80 percent of which was grown on the farm where used, were valued at $49.94. The value of foods per person produced and consumed by white farmers other than croppers for selected counties was $64.64 for Baldwin, $82.48 for Jefferson, and $89 for Pickens. The areas having more satisfactory markets tended to produce less for home consumption. An analysis of the farm records for Pickens County indicated that white farmers who were full owners consumed home-grown foods valued at $96.19 per person, part owners $79.24, renters $72.74, and croppers $67.84. . . . A comparison of the farm diet of Alabama farm people with a recommended minimum-adequate diet indicates that they are receiving more than adequate quantities of foods high in carbohydrates and less than an adequate amount of those high in proteins. Vegetables for supplying vitamins and minerals were usually produced in sufficient quantities; however, the seasonal distribution was not satisfactory."

Farm tenancy in Pennsylvania, P. I. WRIGLEY (*Pennsylvania Sta. Bul. 383 (1939), pp. [2]+37, figs. 3*).—"The objects of this study were to determine the attitude of Pennsylvania tenants toward their problems, to describe the kinds of leases commonly used, and to suggest how unsatisfactory leasing arrangements may be improved." It is based chiefly on United States census reports, details as to leasing agreements and other pertinent information obtained for 208 tenant-operated farms in various parts of the State by personal interviews, and 530 replies by tenants to a questionnaire setting forth 5 advantages and 4 disadvantages of tenancy and a question as to the amount of debt the tenant would be willing to contract in purchasing a farm. The number and distribution of tenants in the State, the attitude of tenants toward their problems, and the relative number of modern conveniences on tenant- and owner-operated farms are briefly discussed. The major part of the bulletin consists of a description of the essentials of a good lease and the types of leases in use, and a discussion of the good and bad features of the different leases and possible improvements.

Results of farm-mortgage financing in eleven counties in New York State, S. W. WARREN (*[New York] Cornell Sta. Bul. 726 (1939), pp. 20, figs. 3*).—Information was obtained from lending agencies making first-mortgage loans regarding 1,460 loans in 8 counties in southern New York and 807 in 3 counties in western New York made during the period 1917–29. An analysis is made to determine the effect on number of foreclosures of land class, elevation, type of road, location with respect to electric lines, number of acres, age of borrower, year loan was made, values of house and barn, loan per acre, etc.

By November 1936, 18 percent of the loans had been paid in full and 25 percent had been foreclosed. Foreclosure and percentage losses in the lower land classes were much higher than in the higher land classes. The difficulties in the higher land classes were more largely a depression problem. Within the same land class farms on hard roads and with electric service available had the smallest percentage of foreclosures. Farms at higher elevations had less loan-paying ability than those at lower elevations in the same land class. Farms with good houses had more loan-paying ability. A good barn was associated with high debt-paying capacity on lands adapted to agriculture, but was not indicative of such ability on lands not adapted to agriculture. The average loans ranged from about $2,100 in land classes 1 and 2 in southern New York to $6,680 in classes 5 and 6 in western New York.

"If a farmer's debt structure was such that he had three chances in four of coming through the depression, he was probably sufficiently conservative for normal times. If this statement is correct, the information obtained in this study would indicate that the following amounts are the approximate maximums which can be borrowed with reasonable safety: About $1,600 in land classes 1 and 2, about $6,000 in land class 3 in western New York and perhaps a little more in southern New York, about $10,000 in land class 4 in southern New York and somewhat less in western New York. If these figures were taken as the maximum loan to be made on the larger and better farms in each land class, the average loan would be about $1,000 in land classes 1 and 2, $2,500 in land class 3, and $4,000 to $4,500 in land class 4."

Report of the Chief of the Agricultural Marketing Service, 1939, C. W. KITCHEN (*U. S. Dept. Agr., Agr. Market. Serv. Rpt., 1939, pp. 31*).—This is the first annual report of the Service (E. S. R., 81, p. 754), as created in October 1938 and formally established at the close of the 1939 fiscal year. The various activities, including the lines of research carried on, on standards, inspection, grading, quality of meats, cotton fiber quality, ginning, spinning, and packaging, and wool shrinkage are discussed.

The marketing of chickens, turkeys, and eggs in Wilmington, H. S. GABRIEL (*Delaware Sta. Bul. 218 (1939), pp. 30, figs. 7*).—This study was made to discover any facts concerning the market for poultry and eggs which might aid in increasing sales of locally produced products. Data were secured by questionnaire in the winter of 1937–38 from 200 housewives, 54 stores, and 21 restaurants. The analysis and discussion deal with the sources of the products; the purchases of refrigerated, locally produced, and canned chickens, broilers, capons, and chickens of heavy breeds and different weights and ages; prices paid for chickens and turkeys; numbers purchased and competition with other meats; dressed v. drawn turkeys; kinds and quality of eggs purchased; buying eggs by weight and grade; preference for white or brown eggs; interval between egg purchases; effect of price on consumption; and other related subjects.

Development of farmers' cooperatives in Tennessee, C. E. ALLRED and B. D. RASKOPF (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 99 (1939), pp. [1]+III+48, figs. 10*).—"This study shows the date of organization of the more important associations now active in the State, sets forth the reasons why the various types of associations were organized, shows what agencies were mainly responsible for the formation of the cooperatives, indicates the size of business of certain types of cooperatives, shows the more important associations now active in Tennessee, and discusses other data pertinent to the history of farmers' cooperative activities in Tennessee."

"Over 1,798 farmers' cooperatives are known to have been organized in Tennessee during the period 1800–1939. Of these 701 are reported active in 1939."

Annual report on tobacco statistics, 1938 (*U. S. Dept. Agr., Statis. Bul. 67 (1938), pp. 108, fig. 1*).—This report is the third in a series of annual reports authorized and requested by Congress (E. S. R., 79, p. 270). It includes a brief classification of leaf tobacco and tables covering acreage, production, and farm value; prices of leaf tobacco and tobacco products; sales; cash income to growers; grade analysis of Connecticut shade grown tobacco; stocks; consumption, wages, material costs, and value of products in tobacco manufacturing industries; international trade; exports; imports; taxes and revenue; and base acreage, marketing quotas, etc., under the agricultural conservation program.

RURAL SOCIOLOGY

[Reports of the Administrator of the Farm Security Administration, 1938 and 1939], W. W. ALEXANDER (*U. S. Dept. Agr., Farm Security Admin. Rpts., 1938, pp. [5]+22; 1939, pp. [5]+22*).—The Administrator, in the 1938 report, discusses the progress of rural-rehabilitation clients, tenant purchases, homestead projects, and the effects of mechanization on status or tenure, and in the 1939 report rehabilitation, community services, medical care for needy farm families, the tenant-purchase program, homestead projects, and camps for migrant farm workers.

[Sociological investigations of the Illinois Station], H. W. MUMFORD, D. E. LINDSTROM, and B. R. HURT (*Illinois Sta. Rpt. 1937, pp. 15–17, 18, 19, fig. 1*).—Studies of farm population movements in depression years and the effect of soil depletion on living standards are briefly noted.

[Investigations in rural sociology in South Dakota] (*South Dakota Sta. Rpt. 1939, pp. 59–63, figs. 2*).—Among topics discussed are the decline in the out-of-State farm population movement, standard of living in farm security loan cases, and trend of population in South Dakota, all by W. F. Kumlien; and child dependency, by R. L. Woolbert.

The rural population resources of Missouri, C. E. LIVELY and R. B. ALMACK (*Missouri [Sta.] Res. Bul. 306 (1939), pp. 40, figs. 11*).—The rural population of Missouri reached its maximum size about 1900. Decline in number of persons since that time has been related to the reorganization of agriculture and other rural industries of the State. Although the birth rate has declined, the rural population, and particularly the rural-farm population, shows a rate of increase considerably above that necessary to maintain a stationary rural population. Intercounty variation is marked, the highest rates of increase being located in the southeastern portion of the State. During the years of economic prosperity before 1930, emigration from the rural districts tended to relieve the threatened population pressure resulting from a high rate of natural increase. With the approach of a stationary population and the increased mechanization of productive processes, interest may center about the problem of obtaining a better relationship between population and opportunity and the problem of improving the quality of the population. An examination of such factors as the ratio of rural population to land area, the per capita value of farm products produced, the plane of living of the rural population, the incidence of dependency in the rural population, and the proportions of rural children attending school leads to the conclusion that the opportunities for the development of the capacities and abilities of the rural population of Missouri are very unequally distributed.

Notes on Montana population trends, R. R. RENNE. (Mont. State Col.). (*Rural Sociol., 4 (1939), No. 3, pp. 346, 347*).—Montana population decreased 2.1 percent from 1920 to 1930 according to birth and death figures which do not

show the considerable changes in population resulting from migration into or out of the State. According to the school census, which does reflect these changes, the number under 21 yr. of age decreased from 213,222 in October 1930 to 209,090 in October 1938. Still more important are the changes that are occurring in the distribution of this population within the State. Nineteen of Montana's 56 counties show increases in population under 21 yr. of age in October 1938 compared with October 1930, while the remaining 37 counties show decreases, and 10 decreases of more than 25 percent. Significant changes have occurred in many counties since 1935, the population under 21 in one county declining a sixth during the past year and 7 other counties showing declines in population under 21 of approximately a fifth or more in the past 3 yr. While a declining population does not necessarily mean poorer agricultural and business conditions and lower standards of living, securing more satisfactory living conditions and higher standards of living with a smaller total population in a State or in certain areas of a State implies an intelligent adaptation of human institutions and patterns of use to the basic natural resources of these areas.

The impact of mechanization of agriculture on the farm population of the South, B. O. WILLIAMS. (Clemson Agr. Col.). (*Rural Sociol., 4 (1939), No. 3, pp. 300–311*).—The author presents a hypothesis that southern agriculture will continue to increase gradually and slowly and over a long period of time. A series of propositions leading to the conclusion that serious problems arising out of mechanization should be carefully studied and appraised is set forth.

Effect of industrial development on population change, C. E. ALLRED and J. P. BURNETT (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 96 (1939), pp. [1]+I+49, figs. 26*).—Industrial development in the areas studied has not resulted in an increase of undesirable people. The Knoxville area and the Kingsport area have lost very few people, and industrial development in these areas has retained the young people in the surrounding rural communities. On the other hand the Clinton area, with but one large industry, and the Rogersville area, with no large industry, have lost many young people and even entire families who have gone to what they consider better economic and social opportunities.

Under modern conditions industrial development is no longer confined to banks of streams but can be decentralized to sources of raw material at suitable locations. "Future industrial expansion probably should permeate the rural areas in which the agricultural population is now suffering because of lack of supplementary source of income. . . . The market surplus of farm products, however, makes [a back-to-the-farm] movement of questionable value unless there is developed a source of income other than the marketing of agricultural products. It seems that the development of a well-balanced industrial and agricultural program would enable many people to produce what they consume and at the same time have an adequate income with which to purchase the other necessities of life. Apparently this problem is now being solved to some extent in part-time farming areas."

Educational foundations for rural rehabilitation, R. W. ROSKELLEY and O. F. LARSON (*Colorado Sta. Bul. 457 (1939), pp. 34, figs. 7*).—Continuing the series (E. S. R., 80, p. 268), a survey made in 9 sample Colorado counties showed that 2,390 heads of rural relief households completed an average of 6.6 school grades. Approximately 2 out of 5 (39.1 percent) heads of relief households did not complete any grades beyond the sixth. Five and nine-tenths percent of the heads were graduated from high school, 1.5 percent completed at least 1 yr. of college, and only 0.2 percent were graduated from college. Female

heads of relief households completed more years of formal education than did males. The average schooling completed by heads of households who were beet laborers was only 3.5 grades. White dependent members of relief households from 16 to 25 finished, on the average, 2.6 more grades than nonwhites of the same age. Educational retardation and such factors as (1) a low economic status necessitating public assistance, (2) different types of unsocial conduct, or (3) personality disorganization are closely related.

Some rural social agencies in Missouri, their nature and extent, C. E. LIVELY and R. B. ALMACK (*Missouri Sta. Res. Bul. 307 (1939), pp. 58, figs. 25*).—The authors discuss the educational, religious, health, welfare, economic, and social and recreational agencies of Missouri.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

[Farm bureau membership in Illinois], H. W. MUMFORD, R. C. ROSS, and D. E. LINDSTROM (*Illinois Sta. Rpt. 1937, pp. 7, 8, 9, fig. 1*).—The distribution by counties is discussed in its relation to economic advantages in the respective counties.

Agricultural research for Mississippi farmers, C. DORMAN (*Miss. Farm Res. [Mississippi Sta.], 2 (1939), No. 12, pp. 3, 6, 7*).—This is an evaluation of potential returns from the general application of farming practices recommended by the station.

Personality training as well as training in skills 4–H goal, D. E. LINDSTROM and H. W. MUMFORD (*Illinois Sta. Rpt. 1937, pp. 11, 13–15, figs. 2*).—Data from tests and questionnaires given 2,263 boys and girls to determine the effectiveness of the 4–H program in Illinois are shown graphically and discussed.

FOODS—HUMAN NUTRITION

Food control: Its public-health aspects, J. H. SHRADER (*New York: John Wiley & Sons; London: Chapman & Hall, 1939, pp. IX+513*).—This book, written to meet the needs of students of public health and food control, food chemistry and nutrition, home economics, nursing, and preventive medicine, presents collected information that serves to give a broad comprehension of why food control is necessary, what industrial practices are concerned in such control, and how control measures are applied. The first chapters dealing with the problems of food control, food technology, relation of food to public health, and control measures give a general discussion of principles. The chapters that follow are devoted to classes of foods which have been found to have an important bearing on public health. Foods which do not have this significance are not considered. Milk and milk products, meat and its products, poultry, eggs, fishery products, cereals and bakery products, fresh fruits and vegetables, and preserved foods are the classes considered, each one being discussed from the standpoint of technology, relation to public health, and regulatory control. A summary on the equivalence of vitamin units and a digest of the new Federal Food, Drug, and Cosmetic Act are appended.

Report of the Chief of the Food and Drug Administration, 1939, W. G. CAMPBELL (*U. S. Dept. Agr., Food and Drug Admin. Rpt., 1939, pp. 32*).—In this annual report (E. S. R., 80, p. 556) the Food, Drug, and Cosmetic Act of June 25, 1938, is discussed, and the work done in the past year under the Food and Drug Act of June 30, 1906, is considered, including enforcement statistics, food and drug adulterations and violations involving economic cheats, food poisoning outbreaks, vitamin tests, certification of coal tar colors, and comments on court cases. Work done under the Insecticide Act, the Caustic Poison Act, the Import Milk Act, the Tea Act, the Filled Milk Act, and the Naval Stores Act is also covered.

The Food, Drug, and Cosmetic Act (*U. S. Dept. Agr., Sec. Agr. Rpt., 1939, pp. 167–169*).—The discussion presented points out benefits to be received from the enforcement of this new statute.

Foods and nutrition [at the Bureau of Home Economics] (*U. S. Dept. Agr., Bur. Home Econ. Rpt., 1939, pp. 9–13*).—In this annual report (E. S. R., 80, p. 702) are cited numerous studies bearing on nutritive values and requirements and others pertaining to food utilization.

[Studies in foods and nutrition by the Illinois Station] (*Illinois Sta. Rpt. 1937, pp. 300–310, 313–315, figs. 5*).—Progress reports (E. S. R., 78, p. 274) are given of studies on factors affecting the carotene content of corn, by J. Outhouse and J. Smith cooperating with J. R. Holbert; the relationship of sex and calorie intake to calcification in rats, by Outhouse and Smith; calcium and iron needs of preschool children, by Outhouse, G. Kinsman, D. Sheldon, I. Twomey, M. Hathaway, Smith, H. H. Mitchell, and T. S. Hamilton, that with calcium having been already noted (E. S. R., 82, pp. 132, 133); the cake-baking characteristics and chemical composition of Fulhio wheat flour, by S. Woodruff; and factors affecting the viscosity of wheat starch, and the effect of manufacturing conditions on gel strength of cornstarch, both by Woodruff and M. M. MacMasters.

The importance of durum wheat in American agriculture and industry.—III, The determination of the quality of durum wheat and macaroni products; experimental milling of semolina, macaroni manufacture, and evaluation of cooking quality, R. H. Harris and D. Knowles. (N. Dak. Expt. Sta.). (*Macaroni Jour., 21 (1939), No. 7, pp. 6–8, 10, 12, figs. 4*).—The experimental milling of semolina, the manufacture of macaroni on an experimental scale, and the evaluation of macaroni and spaghetti for cooking quality are discussed briefly from the standpoint of the technics developed within recent years, literature citations being given for these methods.

Quality tests were made on 10 commercial samples of macaroni and 9 of spaghetti which were rated visually for color, analyzed in the raw and the cooked state, and rated for cooking quality. Values for ash and protein, reported on the basis of 13.5 percent moisture, averaged 0.64 and 11.94, respectively, in the raw macaroni and 0.38 and 12.2 percent in the cooked samples. For spaghetti the values for ash and protein were 0.59 and 11.95 percent for the raw product and 0.39 and 12.0 for the cooked samples. These values point to considerable loss of mineral matter in cooking but no significant change in the protein content. As an index to cooking quality, increase in weight and volume and percentage of residue in the cooking water were determined. The amount of residue in the cooking water remained fairly constant, the results indicating no relationship between quality and the amount of residue. Samples of macaroni and spaghetti which were processed from semolina rated as No. 1 yielded the most satisfactory results in terms of increase in weight and volume during cooking.

An active whipping substance from soybean flour, B. M. Watts and D. Ulrich. (Univ. Calif.). (*Indus. and Engin. Chem., 31 (1939), No. 10, pp. 1282, 1283*).—The whipping material is prepared by extraction of undenatured solvent extracted soybean flour (ground to pass a 60-mesh sieve) for 30 min. at pH 5, followed by neutralization and drying under reduced pressure. With two successive extractions of the soybean flour the yield of dry powder is about 37 percent. The product is described as a light yellow somewhat hygroscopic powder, salt and sweet to taste and without the typical bitterness of the original flour, with a composition on the water-free basis as follows: Protein 32.2 percent, ash 14.3, nitrogen-free extract 46.5, sucrose 28.2, and reducing sugar

as invert 0.017 percent. In water solution in concentrations of 5, 7.5, 10, and 15 percent the product whips readily, giving volume increases of 1,220, 1,310, 1,360, and 1,480 percent, respectively, with drainage in the several cases amounting to 10, 8, 7, and 5.5 cc. in 20 min. Solutions containing from 10 to 15 percent of the dried extract may be successfully substituted for egg white in standard recipes for hard meringues, candies of the divinity type, and soufles, and solutions of 4 and 5 percent concentration may be used successfully in the preparation of cold whips, toppings, and frozen desserts. The product, however, does not give satisfactory results in the preparation of angel food cake.

Since preparation of the extract is carried out at pH 5, the isoelectric point of glycinin, and since legumelin can be removed by heat coagulation, with only slight impairment of the foaming ability, it is evident that neither of these proteins is responsible for the whipping property.

Various fats used in deep-fat frying of dough mixtures at high altitudes, E. J. Thiessen. (Wyo. Expt. Sta.). (*Food Res., 4 (1939), No. 2, pp. 135–143*).—This study consisted of formula modifications for doughnuts and determinations of satisfactory frying temperatures at the altitude of the station (7,200 ft.), together with comparisons of the frying life of four fats—lard, corn oil, cottonseed oil, and hydrogenated fat.

The complicating factor was the lack of standard sea-level recipes for doughnuts. Fairly satisfactory results were obtained by using half hard-wheat and half soft-wheat flour and for every 100 parts of the flour 40–43 of sugar, 16–20 of whole eggs, 43–53 of milk, 2 of fat, and 1–1.8 parts of baking powder. The quantities of sugar, milk, and eggs were between minimum and maximum quantities found in low-altitude recipes, fat the same as the minimum, and baking powder from slightly to decidedly less than the maximum. The proportion of egg yolk to egg white was found to be of some importance. The best results were obtained with eggs in the proportion of one-third yolks to two-thirds whole eggs.

The smoking points of the fats were approximately the same as reported for low altitudes, but the frying temperatures frequently recommended at low altitudes (350°–400° F.) proved too high. Doughnuts fried at 350° for 3 min. were golden brown in color, at 365° for 2 min. a deep brown, and at 390° for 1½ min. a very dark brown. Under the same conditions of frying approximately the same amount of fat was absorbed for each of the different fats. Two percent more fat was absorbed at the highest than at the lowest temperature. With repeated use the smoking points of the different fats were lowered considerably, but less with lard than with the others. The changes were accompanied by increases in acidity. These were not enough to cause disagreeable flavors in the doughnuts after 12 hours' use, but after 18 hr. the flavor of the doughnuts fried in lard and hydrogenated vegetable fats became slightly objectionable. Storing lard in a cool place and keeping it tightly covered are recommended as a means of prolonging its frying life through preventing the development of rancidity.

Freezing as a means of retarding bread staling, W. H. Cathcart and S. V. Luber (*Indus. and Engin. Chem., 31 (1939), No. 3, pp. 362–368, figs. 3*).—This detailed report of studies noted previously in summary (E. S. R., 81, p. 448) includes a review of the literature on the subject, a description of the experimental procedures followed in objective and subjective tests for judging the rate of staling, and the tabulated data from which the conclusions in the summary report were drawn.

Some aspects of the mineral composition of potato tubers in relation to blackening after cooking, W. E. Tottingham. (Wis. Expt. Sta.). (*Amer. Potato Jour., 16 (1939), No. 8, pp. 199–203*).—Analyses of raw potato tubers, sections of which had been cooked to observe blackening tendencies, indicated no

correlation between blackening of the boiled potatoes and disturbance in the mineral balance. Values reported as percentage of dry matter for total potassium, calcium, iron, boron, copper, and phosphorus in normal and blackening potatoes of the same lot showed much overlapping of the two groups with respect to the range in content of these several elements.

U. S. standards for canned fruits and vegetables and how the institutional buyer may use them, P. M. WILLIAMS. (U. S. D. A.). (*Pract. Home Econ., 17 (1939), No. 2, pp. 52, 54, 55*).—This address deals with the standards developed by the U. S. D. A. Bureau of Agricultural Economics for quality grades of canned fruits and vegetables. The requirements of such standards, the meaning of quality grades, and the use of these standards for grades in actual purchasing practice are considered.

Retail food prices in relation to amounts, styles, and containers, M. E. TIFFANY (*Vermont Sta. Bul. 448 (1939), pp. 51, figs. 5*).—Data were obtained monthly throughout 1937 in 20 Burlington retail grocery and combination stores on 28 foods commonly used in the average American household. The foods included cereals and cereal products, certain fresh, dried, and canned fruits and vegetables, canned salmon, sugars, sirups, evaporated milk, and various miscellaneous items. Several products were available in both bulk and package form, a few in more than one style, many in packages of various sizes, and a few in containers of different sorts. Prices were secured for quantities such as an average family could consume before the food deteriorated. The findings as to availability and prices are tabulated for each commodity and discussed in some detail. In summary it is pointed out that "bulk goods, when available, cost less than those sold in packages; that almost invariably the larger the package the less its contents cost per pound; and that discounts on multiple units were often offered by all types of stores."

Nutrition and the public health: Medicine, agriculture, industry, education (*London: Brit. Med. Assoc., 1939, pp. 150*).—This volume comprises the proceedings of a national conference on the wider aspects of nutrition held under the auspices of the British Medical Association, April 27–29, 1939. Following the inaugural address by A. Salter, dealing with economic and administrative questions of national food policy in war and peace, the program consisted of three main topics, with several papers and general discussion under each as follows: Medical Aspects of Nutrition, by E. P. Cathcart, R. McCarrison, and G. P. Crowden; Means of Stimulating Production—(A) Home Agriculture, by Viscount Astor, K. A. H. Murray, A. Hurd, and W. C. Miller, and (B) Overseas Producers, by F. L. McDougall, W. Allen, and G. V. Jacks; and Means of Stimulating Consumption—(A) Family Allowances, Cheap or Free Milk or Meals, by L. S. Amery, L. J. Cadbury, K. Lee, G. Gibson, and S. Churchill, and (B) Education, by W. O. L. Smith, V. H. Mottram, and Mrs. H. Haldane An appendix contains an abstract of The Sir Charles Hastings Lecture, 1939, Nutrition and the Public Health, by V. H. Mottram.

Nutrition and physical fitness, L. J. BOGERT (*Philadelphia and London: W. B. Saunders Co., 1939, 3. ed., rev., pp. 602, figs. 75*).—The present revision of this volume, noted previously (E. S. R., 73, p. 868), has been rather extensive, some of the more general subject matter having been cut slightly to make room for new material and the entire book having been reset to admit of using frequent headings and summaries, and outline form for certain presentations. An introductory chapter that goes more fully into the general composition of foods has been introduced, and the chapters on food economics, recent trends in American dietary habits, metabolism and the ductless glands, food fads and fancies, and vitamins have received particular revision to include more recent

facts and figures, more illustrative material, and research advances. The author has kept to a general treatment of the broad field of nutrition.

Nutrition and the health of the school child, M. S. Rose (*Jour. Amer. Dietet. Assoc., 15 (1939), No. 2, pp. 63–85, figs. 14*).—In this address, delivered at the 1938 meeting of the American Dietetic Association, the author traces briefly the history of progress in the feeding of school children and proposes a five-point diet centering on vitamin A, calcium, iron, vitamin C, and vitamin B_1. The function of each of these food essentials is discussed, with suggestions for the goal for each in the school lunch or as the day's requirement. The importance of health and nutrition education programs in the schools is emphasized, and in conclusion a covenant of faith for all school dietitians is offered.

Nutritional standards for the school lunch, E. E. Hawley (*Jour. Amer. Dietet. Assoc., 15 (1939), No. 2, pp. 96–100*).—The daily food requirements for children of late grammar or high school age are summarized as protein 1 gm. per pound of body weight, calcium 1, phosphorus 1.5 gm., and iron 16 mg., with tentative vitamin requirements of vitamin A 7,000 International Units, vitamin D 700 I. U., vitamin B_1 300 I. U. or 1 mg. of thiamin, vitamin B_2 400 Sherman-Bourquin units or 2 mg. of riboflavin, and vitamin C 1,200 I. U., 600 Sherman units, or 60 mg. of ascorbic acid. Sufficient nicotinic acid is thought to be assured with adequate milk and liver. School dietitians are urged to plan school lunches to meet more nearly the day's requirement, particularly of protective foods.

Basal metabolism of Connecticut State College students, E. C. Rogers. (Conn. State Col.). (*Jour. Nutr., 18 (1939), No. 2, pp. 195–203, figs. 3*).—The average basal metabolic rates for 110 women students varied from the Aub-DuBois standard by −2.3, the Harris-Benedict by −1.9, and the Boothby, Berkson, and Dunn standard by −0.4. Similar averages for 50 college men students were −1.6, +0.8, and −2.5, respectively. The individual values varied widely, particularly for the women students. "The excellent quality and quantity of food may be a factor in producing a relatively high average, and the extremes of range may correlate with overactivity or with emotional states common to college life."

A new carbohydrate for prevention of nutritional anemia in infants.—Preliminary report, C. L. Wilbar, Jr. (*Amer. Jour. Diseases Children, 58 (1939), No. 1, pp. 45–60, figs. 2*).—A sugarcane concentrate, prepared by boiling down the cane juice in a copper pan and clarifying by settling, decanting, and filtering through filter-cel, was found to contain 1–3 mg. of iron per 100 gm. and approximately 0.2 mg. of copper per 100 gm. of juice. Manganese, calcium, phosphorus, potassium, and magnesium were shown spectroscopically to be present in the sirup, which contained approximately 75 percent of solids. The iron, determined by the orthophenanthroline method, was all soluble and nearly all in the ferrous state. When used in 45-cc. (60-gm.) portions per 24 oz. of the infant feeding formulas, this sirup furnished sufficient iron and copper in addition to that obtained from the milk and vegetables (added to the diet at 3 mo.) to prevent nutritional anemia. This was in contrast to earlier results obtained with a sirup clarified with suchar (a decolorizing vegetable carbon) and containing but 0.19–0.24 mg. of iron per 100 gm. of sirup.

Until the introduction of the new sirup, nutritional anemia among infants and young children was found to a considerable degree among children of the sugar plantations of Hawaii, a study of 242 of the children having shown a hemoglobin average of 9.8 gm. per 100 cc. of blood and a red cell count averaging 3,700,000. After a year's use of the new sirup the hemoglobin averaged 11.8 gm. per 100 cc. of blood and the red cell count 4,250,000 in 168 children from 3 days to 3 yr. in age.

The following year the hemoglobin averaged 12.6 gm. per 100 cc. and the red cell count 4,700,000 in 171 children in this age group. Seventy-four children under 3 yr. of age in the control group receiving no supplementary iron showed anemia after 2 yr., with a mean value for hemoglobin of 9 gm. per 100 cc. of blood.

The relationship of carbohydrate metabolism to protein metabolism.—I. The roles of total dietary carbohydrate and of surfeit carbohydrate in protein metabolism, D. P. CUTHBERTSON and H. N. MUNRO (*Biochem. Jour., 33 (1939), No. 1, pp. 128–142, figs. 5*).—In this investigation, conducted on four human subjects, it has been shown that when the carbohydrate and protein components of an adequate diet are consumed separately over periods of time there is a negative nitrogen balance amounting to about 2 gm. daily and consisting chiefly of urea. There is a corresponding loss of sulfur but no change in creatinine excretion. The loss in nitrogen is equally distributed between the day and night portions of the 24-hr. urines, but the loss in sulfur is confined to the day urines. If only a small part of the day's intake of protein is taken with the carbohydrate the nitrogen metabolism is undisturbed. If carbohydrate is taken over a considerable period of time in excess of energy requirements, nitrogen and sulfur are stored no matter whether the carbohydrate is taken with the protein or separately. Variations from 8 to 2 in the number of meals per day in a fixed diet cause a transitory loss of nitrogen, but do not affect the digestibility or absorbability of the protein and fat of the diet.

Four hypotheses are advanced in explanation of the losses of nitrogen from the body resulting from the separate ingestion of the protein and carbohydrate in an adequate diet. The one considered most probable is that "a specific inhibitory action of carbohydrate on the deaminases of the body might exist, an inhibition which would not come into play unless both carbohydrate and protein were simultaneously ingested."

Studies of fat-free diets, G. J. MARTIN (*Jour. Nutr., 17 (1939), No. 2, pp. 127–141*).—In a group of 70 rats fed a fat-free basal diet complete as to vitamin and mineral supplements, the only infallible symptoms of the fat deficiency were subnormal weight and scaliness of the feet, though even the incidence of scaly feet was not 100 percent; only 20 percent showed caudal necrosis in 6 mo., and hematuria was observed in only 50 percent of the animals. Animals on the fat-free diet reached a weight plateau in 4–5 mo., but other animals receiving from the time of weaning daily prophylactic supplements of 10 drops (300 mg.) of methyl linoleate reached a plateau in 7–9 mo. When this amount of linoleate was fed curatively after the plateau on the fat-free diet had been reached, a second plateau was established in 6–12 mo., the maximum weights attained with curative treatment being comparable to those obtained with prophylactic treatment. It is pointed out, however, that within any of the groups there was great biological variation with regard to weight response.

Other experiments indicated that the response to linoleate therapy was fairly constant for dosages from 30 to 360 mg. of methyl linoleate daily. It is concluded that the minimum level of methyl linoleate for optimum growth may be tentatively placed at or below 1 drop (30 mg.) per rat per day. The average and maximum plateau weights attained under prophylactic or curative treatment with methyl linoleate (at the 10-drop level) were appreciably higher than on the fat-free diet. The average, however, was only about 75 or 80 percent of the weights of animals on the stock ration. An additional supplement of 4 drops of methyl linolenate administered at the plateau level on the linoleate therapy was not effective in producing further growth response. It is concluded, therefore, that methyl linolenate cannot supplement methyl linoleate in the diet of the rat. Positive growth response was attained, how-

ever, with supplements (1 gm. per rat per day) of liver or brain or ether extract of brain administered at this plateau level. Although both brain and liver contain arachidonic acid, it is considered problematical at this stage whether the work of Turpeinen (E. S. R., 79, p. 716; 82, p. 419) has bearing on the present results.

The mineral content of the edible portions of some American fishery products, H. W. Nilson and E. J. Coulson (*U. S. Dept. Com., Bur. Fisheries. Invest. Rpt., 2 (1939), No. 41, pp. II+7*).—This report presents the first general summary of analyses of the mineral content of various fishery products, carried out as part of the detailed study of the nutritional value of these foods. Data are reported on the percentage of dry matter, calcium, magnesium, phosphorus, iron, copper, and iodine in the edible portion of the following: Fresh fillets (bone-free, skin-free muscle) of cod, haddock, mackerel, red snapper, mullet, pilchard, flounder, and lake herring; canned salmon, analyses representing the entire contents of the can, and the samples including red, Chinook, coho, pink, and chum salmon, the five commercially important species of the Pacific coast; eastern oysters and the native and Japanese varieties of Pacific oysters; raw and boiled shrimp; and white and claw meat of blue crab. All of the species analyzed are identified by their scientific names, and the analytical methods employed are indicated.

The analysis and differentiation of the composition of iron, phosphorus, and calcium compounds in respect to nutritional requirements (*Analyst, 64 (1939), No. 758, pp. 332–339*).—In this report of a symposium on the subject, the historical introduction by J. C. Drummond is given in full and papers on the individual mineral elements are noted in abstract as follows: The Ionizable and Available Iron in Foods, by R. A. McCance; Phosphorus Compounds in Relation to Nutrition, by H. D. Kay; and Calcium Compounds in Relation to Nutrition, by E. C. Dodds and J. D. Robertson.

Blood calcium and phosphorus in the newborn, W. R. Todd, E. G. Chuinard, and M. T. Wood (*Amer. Jour. Diseases Children, 57 (1939), No. 6, pp. 1278–1287*).—This work, undertaken as part of a general study on the nutritional status of preschool children and newborn infants in Portland, Oreg., presents the findings on the calcium and phosphorus content of the blood serum of all newborn infants delivered at the Multnomah County Hospital from March 1, 1935, to March 1, 1936. In each case two samples of blood were taken from the anterior fontanel, the first (blood I) being withdrawn during the first 3 days of life and the second (blood II) during the period from the fourth to the seventh day. The study included a total of 639 cases (1,202 calcium and 1,078 phosphorus determinations), in 65 of which estimations on cord blood were also taken for comparison with the values of venous (fontanel) blood. The results, tabulated in some detail, are analyzed for significant variations and are compared with pertinent data (832 calcium and 645 phosphorus determinations) summarized from the available literature.

Blood II was significantly higher in calcium and lower in phosphorus than blood I. The averages for the two groups were 10.15 ± 0.022 mg. per 100 cc. for calcium and 6.03 ± 0.021 mg. for inorganic phosphorus, the respective ranges being 7.2–13.9 mg. and 3.5–8.6 mg. The calcium-phosphorus product averaged 61. A definite seasonal variation was found in the serum levels, calcium being higher in the autumn and winter and phosphorus being slightly though significantly higher in the spring. The calcium-phosphorus product followed the seasonal variations in serum calcium. No variations in either element were referable to weight or sex of the infant. Babies of mothers who had three of more children showed significantly lower serum calcium levels.

Calcium and phosphorus in the cord blood averaged 10.98 and 5.54 mg. per 100 cc., respectively, whereas the corresponding values for the fontanel blood of these same cases (65) were 9.62 and 5.97 mg. per 100 cc. The calcium-phosphorus products for the cord and fontanel blood were 61.75 and 57 mg., respectively. There is, therefore, an actual difference in the amounts of calcium and phosphorus contained in the cord and fontanel blood serum, though apparently the quantities of these elements are adjusted to a new equilibrium within the first 24 hr. of life. It is considered that determinations on cord blood do not provide a true indication of the calcium and phosphorus content of the circulating blood of the newborn infant.

The calcium requirement of older male subjects, E. C. Owen (*Biochem. Jour., 33 (1939), No. 1, pp. 22–26*).—A number of 3-day calcium and phosphorus balances for 10 male subjects, ranging from 32 to 69 yr. of age and 6 being over 50 yr., are reported for two levels of calcium intake, averaging 524 and 879 mg. daily, with average phosphorus levels of 849 and 1,227 mg. On the lower calcium intake the balances were negative in half and positive in half of the cases, the average being −4 mg. On the higher calcium level the balances were all positive, averaging +152 mg. per day. All of the subjects excreted phosphorus, chiefly in the urine, and all but one excreted considerably more calcium in the feces than in the urine. From the results obtained, the minimum calcium and phosphorus requirements of these subjects are estimated to be about 520 and 1,200 mg., respectively. It is noted that the values for calcium agree well with the estimate of 450 mg. per person per day, as given by Sherman (E. S. R., 44, p. 563), and the 550-mg. estimate of Leitch for adult, nonpregnant, nonlactating women. The estimated phosphorus requirement exceeds the 900-mg. estimate of Sherman (E. S. R., 42, p. 554), but is similar to figures reported in various reviews in the literature.

The author concludes that the calcium requirements of older males are much the same as those of younger adults, and that consequently long subjection to a diet low in calcium is not offset by increasing age. This conclusion is considered of significance in support of the hypothesis that senile osteoporosis is related to long-standing calcium deficiency.

Citric acid and its salts as calcifying agents in rats, M. L. Hathaway and F. L. Meyer (*Jour. Nutr., 17 (1939), No. 5, pp. 419–427*).—Young rats were kept from weaning (21–25 days of age) on the Steenbock-Black rickets-producing diet 2965 for 22 days, after which they were given for a period of 10 days lactic acid, citric acid, or various citrates as supplements at levels of 0.04 mol per 100 gm. of the basal diet. On the eleventh day the animals were killed and their femurs preserved in 95 percent ethyl alcohol and the tibias in acetone for analyses of bone ash and line tests, respectively.

Although there was not entire agreement between the results of the line test and the bone ash values, both indicated that citric acid and lactic acid cause only limited improvement but that the citrates, particularly potassium citrate, were definitely effective. The increase in bone ash values for the various supplements averaged lactic acid 2 percent, citric acid 4, sodium citrate 9, citric acid-sodium citrate mixtures 9–11, potassium citrate 13, and citric acid-potassium citrate mixtures 14–16 percent. The calcifying effect of citrates appeared to be unrelated to sex, weight gains, or food intake.

Radioactive iron and its metabolism in anemia: Its absorption, transportation, and utilization, P. F. Hahn, W. F. Bale, E. O. Lawrence, and G. H. Whipple. (Univ. Calif. et al.). (*Jour. Expt. Med., 69 (1939), No. 5, pp. 739–753, fig. 1*).—Difficulties which have been encountered in studying iron metabolism are discussed, with the suggestion that radioactive iron may be the means of solving some of the problems involved. Methods for determining the amount

of radio-iron in biological samples are described, and observations are reported from a repetition with radio-iron of earlier experiments on the absorption, storage, and utilization of iron in dogs. These indicate that when there is a distinct need for iron, as in anemia, a fair quantity will pass from the gastrointestinal tract into the blood stream, but that when there are ample body reserves the absorption is negligible. In both cases the excretion of iron is very slight. The peak of absorption by the anemic dog takes place when the food materials are largely in the small intestine. No significant absorption occurs from the colon. The plasma is the site of transportation of iron from the intestinal tract to the point at which it is used. In contrast with neutral iron, the absorption of radio-iron, when it does occur, takes place very rapidly.

Radioactive iron and its excretion in urine, bile, and feces, P. F. HAHN, W. F. BALE, R. A. HETTIG, M. D. KAMEN, and G. H. WHIPPLE. (Univ. Calif. et al.). (*Jour. Expt. Med., 70 (1939), No. 5, pp. 443–451*).—In continuation of the investigation noted above, the excretion of radioactive iron in the urine, bile, and feces after its intravenous injection as ferrous gluconate in quantities of 100–250 mg. daily was followed in five dogs in various states of iron storage and depletion. During a few days subsequent to the iron injection, there was an initial extra output in the urine and feces, amounting in some instances to from 2 to 8 percent of the injected iron. Following this initial reaction, the urinary excretion dropped to traces or even nothing. The feces in all cases contained measurable amounts of radioactive iron, ranging from 0.05 to 0.4 mg. per day. In one instance, when destruction of the red blood cells was brought about by injections of acetyl-phenylhydrazine, there was a definite increase in the radioactive iron eliminated in the feces, amounting to from 0.1 to 1 mg. per day. Most of this excretion was by way of the biliary tract, although under usual conditions the bile contributes very little, not more than 0.01 mg., of radio-iron to the intestines. These findings are thought to furnish additional evidence in favor of the theory of McCance and Widdowson (E. S. R., 79, p. 134) that the body controls its iron stores by absorption or lack of it rather than by its capacity to eliminate it.

Diurnal variations of hemoglobin in the blood of normal men, E. F. MCCARTHY and D. D. VAN SLYKE (*Jour. Biol. Chem., 128 (1939), No. 2, pp. 567–572, fig. 1*).—Healthy men from 20 to 30 yr. of age served as subjects in determinations of hemoglobin values at 2- or 3-hr. intervals from 9 a. m. to 11 p. m., inclusive. The manometric CO capacity method of Van Slyke and Hiller was used, and its accuracy was indicated by a mean difference between duplicate analyses of 0.06 volume percent of CO capacity. Tabulated results for 18 subjects gave the following average values: Average of individual readings for a single day maximum 21.20, minimum 18.02, and mean 19.86 cc. CO capacity for 100 cc. blood; median for the day 21.31, 17.81, and 19.94 cc.; range for the day above and below median ±1.14, ±0.27, and ±0.64 cc.; and range for the day in percent of median ±5.4, ±1.6, and ±3.2 percent, respectively.

In five of the subjects observations were made on 2 separate days about a week apart. The results as plotted against time of day showed a tendency of the blood of each subject to follow a daily course typical of the individual but with variations which make the direction of change in hemoglobin concentration during the day unpredictable. There appeared to be a tendency for the concentration to decrease during the waking hours, for in 20 of the 23 days observed the hemoglobin at 11 p. m. was less than at 9 a. m.

"The much greater ranges of diurnal hemoglobin variation reported in the past literature appear attributable to methods of analysis which provided a significant part of the variations."

The relation of pyrrole-containing pigments to hemoglobin synthesis, J. O. KOHLER, C. A. ELVEHJEM, and E. B. HART. (Wis. Expt. Sta.). (*Jour. Biol. Chem., 128 (1939), No. 2, pp. 501–509, figs. 2*).—Previous attempts to prove or disprove the hypothesis that chlorophyll may be effective in the cure of anemia are discussed briefly, with the suggestion that discrepancies in the results obtained may have been due to too little attention to the limiting factor for hemoglobin building in the anemia in question. Experiments are reported in which copper was the limiting factor in hemoglobin regeneration in rats, and chlorophyll, protoporphyrin, and bilirubin were tested for their ability to replace copper. These porphyrin derivatives were administered orally or parenterally to rats receiving optimum quantities of iron, but which were in an anemic state through lack of copper. The materials tested had no beneficial effect on hemoglobin regeneration. By means of a chromatogram with anhydrous sodium sulfate as adsorbent, from 50 to 60 percent of the chlorophyll was recovered unchanged from feces pigments of rats which had received chlorophyll orally. The remainder of the chlorophyll appeared in the feces chiefly in the form of probophorbide A (or C) and probophorbide B.

The possibility is suggested that copper may function in the final step of the process of hematopoiesis, namely, the conversion of pseudohemoglobin into hemoglobin.

***A quantitative study, by means of spectrographic analysis, of zinc in* nutrition,** F. I. SCOULAR (*Jour. Nutr., 17 (1939), No. 2, pp. 103–113, fig. 1*).—Thirty-five zinc balance studies were carried out with three normal preschool boys, using a technic similar to that noted earlier (E. S. R., 82, p. 419). The zinc content of food, feces, urine, distilled water, and acid-alcohol was determined in each case by spectrographic analysis of the ash, the zinc lines in the spectrograms being compared with spectra of solutions of known zinc content. The analytical values for food determined by this technic were almost 40 percent lower than estimated values calculated from published analyses.

In the various balance periods the average daily ingestion of zinc varied approximately from 4 to 6 mg. From 0.04 to 6.0 percent of the ingested zinc was eliminated through the urine, while the amount eliminated through the alimentary tract represented from 42 to 164 percent of the ingested amount. In more than two-thirds of the 35 balance studies the retentions were significantly greater than the error determined for the method used, and it is concluded, therefore, that zinc is associated with physiologic function. Six of the 10 negative balances occurred with an ingestion level lower than the average (0.248 mg. per kilogram of body weight) for the entire study. Of the 25 positive balances, 2 of the 3 highest retentions were obtained with the 2 highest ingestion levels, namely, 0.300 and 0.307 mg. per kilogram. On the basis of these results, it is tentatively concluded that 0.307 mg. of zinc per kilogram of body weight will supply the zinc needs of the preschool child.

What's new about the vitamins, C. M. MCCAY. (Cornell Univ.). (*Forecast, 55 (1939), No. 8, pp. 388, 389, 400, 424, figs. 5*).—In the preface to this survey of recent trends in vitamin discoveries, the author calls attention to three outstanding features. "In the first place the philosophy of nutrition has been broadened by the recognition that all forms of life, from plants and microorganisms to man himself, are intimately associated with vitamins. In the second place the entrance of organic chemists into the field of vitamin research has greatly accelerated the synthetic production of these organic essentials. In the third place the realization has grown that large parts of any given population may be on the verge of vitamin deficiencies, although the typical symptoms of disease may be lacking."

Vitamin A and B deficiency—an etiologic factor in acute, subacute, and chronic Vincent's infection and other dental conditions, J. A. Sinclair (*Jour. Amer. Dent. Assoc., 26 (1939), No. 10, pp. 1611–1618*).—Recent literature on vitamin A and vitamin B complex deficiencies is reviewed, with special reference to oral and dental pathology, and the author's experience in the diagnosis and treatment of dental conditions attributable to vitamin deficiency is discussed.

It is suggested that epithelial changes in the oral mucous membranes may develop in persons with vitamin A deficiency due to mechanical irritation from fillings, ill-fitting crowns, and calcareous deposits with resulting slow non-healing or recurring Vincent's infection; that lack of vitamin B_1 or of vitamin A may be involved in the extreme sensitiveness of the teeth to instrumentation and heat and of the soft tissues to the hypodermic needle; that oral conditions described as diffuse atrophy of the alveolar bone, complex periodontitis, and genuine paradentitis may be caused by extreme multiple deficiencies; and that vitamin C deficiency may be a contributing cause to subluxation. Benefits are noted from the treatment of these conditions with massive doses of the vitamins involved.

Mouth lesions associated with dietary deficiencies in monkeys, N. H. Topping and H. F. Fraser (*Pub. Health Rpts. [U. S.], 54 (1939), No. 11, pp. 416–431, pls. 4*).—In this attempt to determine the extent and type of oral pathology in monkeys as a result of selected dietary deficiencies, 40 monkeys after a 3-week standardization period on stock diet were distributed as evenly as possible as regards age (estimated from teeth), sex, and results of stool cultures into nine groups, all but one containing four animals each. The groups were maintained until death, or about 210 days if death had not occurred, on one of the following diets: A basal diet of corn meal, cowpeas, cottonseed oil, sucrose, Osborne and Mendel salt mixture, leached casein, and dried brewers' yeast, with supplements of vitamins A, D, and C, or the same diet with one of the vitamin supplements omitted; a similar basal diet without yeast but supplemented with vitamins A, D, and C, riboflavin, and nicotinic acid, or with either riboflavin or nicotinic acid or both omitted; a mixed diet of natural foods; and a stock diet of whole wheat bread, whole milk, and bananas, with two hard-boiled eggs once a week.

Routine observations were made at least once a week on each animal of the weight, general condition, and condition of the oral cavity and less frequent determinations of hemoglobin content and total red and white cell counts. Blood serum ascorbic acid tests were made by M. E. Reid to ascertain the extent of depletion in the vitamin C-deficient group and the adequacy of the C supplement. Smears of the gums and stool cultures of all of the animals were made every other week and more frequent stool cultures in those developing diarrhea. Photographs were taken of the mouths of all of the animals at the beginning, of all in which pathology was observed in the course of the experiment, and of most of the animals at the end. Routine autopsies were performed and tissues preserved for the histopathological studies reported in the paper noted below.

None of the animals on the stock diet, four of the eight on the supposedly complete diet, all but one on the vitamin A-deficient diet, and all on the other deficient diets died before 210 days, the survival periods decreasing in the order controls on the artificial diet 165+ days, A-deficient 162, B_2 complex controls 98, C-deficient 95, D-deficient 85, B_2 complex-deficient 76, nicotinic acid-deficient 67, and flavin-deficient 54 days. No mouth lesions at death were observed in the controls on the stock diet and in only two cases in the controls on the

artificial diet. In all of the other groups gingivitis and necrosis of interdental papillae were present in from one to all four of the animals, and necrotic gingivitis in all but those on the A-deficient diet. Ulceration of the buccal mucosa was present in one or two of the animals in each of the groups deficient in one or more factors of the B_2 complex. Lesions resembling noma were found in one animal in each of the B_2 complex-deficient groups except the one supplemented with flavin. Transfers of material from the mouths of affected monkeys to healthy animals on stock diet failed to produce any evidence of stomatitis.

An extensive list of literature references is appended.

Oral pathology in monkeys in various experimental dietary deficiencies, T. H. TOMLINSON, JR. (*Pub. Health Rpts. [U. S.], 54 (1939), No. 11, pp. 431–439, pls. 3*).—This paper discusses in further detail, with microphotographs, the oral pathology of 39 monkeys from the investigation noted above.

The epithelial attachment showed some alteration in most of the animals, varying from slight focal thickening to complete necrosis. Cellular infiltration of the free gingiva was seen in all animals. Blood pigment or hemorrhage was present in sections from all the C-deficiency animals and from one each in the groups deficient in vitamin D, flavin, and the B_2 complex supplemented with flavin and nicotinic acid. Necrosis occurred in none of the animals on the stock diet, and was present in the gingiva of only three on the synthetic diet with the various supplements. Among the remaining 28 animals necrosis in varying degrees developed, with the most extensive lesions in the various B_2 complex-deficient groups. Among the 16 monkeys fed a B_2 complex-deficient diet supplemented only with flavin or nicotinic acid, 1 showed marked ulceration of the buccal mucosa, 1 a large area of necrosis on the oral surface of the lower lip, and 3 perforating necrotic lesions of the cheeks or lips.

Vitamin A elimination in the urine and the reticulo-endothelial system [trans. title], W. THIELE and U. KLODWIG (*Klin. Wchnschr., 18 (1939), No. 23, pp. 821, 822*).—Determinations of the vitamin A elimination in the urine were carried out simultaneously with functional tests on the reticulo-endothelial system. The functional test employed was based on the characteristic of this system to store electronegative colloids, injury to the system resulting in decreased storage ability. A definite amount of Congo red was injected intravenously, and the amount stored was determined at 4- and 60-min. intervals after injection by photometric determinations on drawn samples of the blood. Vitamin A in the urine was determined by the Carr-Price method. These tests were carried out on patients with various diseases, large doses of vitamin A (360,000 International Units orally per day) being administered to those who showed no spontaneous vitamin A elimination. In view of the results obtained, the patients could be divided into three classes, namely, those who showed no spontaneous urinary elimination of vitamin A, those who showed elimination only after large oral doses of the vitamin, and those who showed no such elimination even after the vitamin dosage. Retention of the dyestuff was low (3.9–15.1 percent, with two specific exceptions) in the first group, somewhat higher in the second (28.2–45.7 percent), and still higher in the third (13.1–53.4 percent). These results are considered to confirm the assumption that urinary elimination of vitamin A in disease is associated with damage to the reticulo-endothelial system.

[Effect of freezing meat on vitamin B_1] (*South Dakota Sta. Rpt. 1939, p. 52*).—It is noted in this progress report (E. S. R., 81, p. 304) of studies by M. Kellogg and E. Pierson that freezing at −4° F. and subsequent storage for 3 mo. at 10°–12° do not materially affect the vitamin B_1 content of lamb muscle tissue and organs.

The concentration of vitamin B_1 in the tissues of the rat, A. S. Schultz, R. F. Light, L. J. Cracas, and L. Atkin (*Jour. Nutr., 17 (1939), No. 2, pp. 143–149*).—To rats on a B complex-free diet were given supplements of dry yeast and in some cases additional crystalline vitamin B_1 in amounts to furnish from 10 to 515 μg. of vitamin B_1 per rat per day. When the animals reached excretion equilibrium, a point at which the vitamin output in the urine remained constant and related to the intake, they were sacrificed, and the vitamin B_1 content was determined for the entire carcass in some cases and for specific organs in others, the assays being carried out by the method of Schultz, Atkin, and Frey (E. S. R., 79, p. 11).

The results show a gradual increase in the B_1 content of the body with increasing levels of intake up to 65 μg. The body tissues were apparently saturated with the vitamin at this point. At this maximum retention the B_1 concentration was approximately 2 μg. per gram of body weight. Analyses of the individual organs showed a considerable difference in the concentration of vitamin B_1 therein. With the lower levels of B_1 intake, the testes were the highest in B_1 concentration (1.87–4.7 μg. per gram), although at the higher levels of intake at which all tissues gained in vitamin content, the liver showed the highest concentration, with amounts as high as 10 μg. per gram. The phenomenon of vitamin B_1 retention and depletion is discussed in the light of the enzyme theory of vitamin B_1 function.

Influence of massive doses of vitamin B_1 on fertility and lactation, B. Sure. (Univ. Ark.). (*Jour. Nutr., 18 (1939), No. 2, pp. 187–194*).—Four groups of experiments on rats are reported. In group A crystalline vitamin B_1 (thiamin) was fed in 10-μg. doses through two generations with normal fertility and lactation. On raising the dose to 200 μg. for the third generation, toxic effects were apparent, lactation efficiency dropped from 95 to 41 percent, and one female out of six was sterile. In group B 100 μg. of thiamin was fed through two generations with 100 percent fertility in the first and two out of four females sterile in the second. On raising the dose to 400 μg. for the third generation, five out of six failed to rear their litters and one was sterile. In group C 200 μg. of thiamin was administered through two generations, with two of six females sterile in the first and none of two females in the second. On administering 600 μg. of thiamin in the third generation, four of six females were sterile. In group D fertility and lactation were normal for two generations on 400 μg. of thiamin. On raising the thiamin to 800 μg. in the third generation the infant mortality was 88 percent. In all instances growth was much greater with thiamin supplements than on the stock diet alone.

The occurrence of vitamin B_2 (lactoflavin).—IV, The uptake of lactoflavin by proteins [trans. title], J. Schormüller (*Ztschr. Untersuch. Lebensmtl., 78 (1939), No. 2–3, pp. 124–138, figs. 5*).—In continuation of previous studies (E. S. R., 82, p. 280), dried finely pulverized protein preparations obtained from the muscle of the horse and of the goose were shaken in definite amounts and for a given length of time with definite volumes of lactoflavin solutions of varying concentrations, the decrease in concentration of the solutions being noted after each shaking period. From this information the uptake per gram of protein was calculated, the values in the different experiments being plotted against the final equilibrium concentrations (in milligrams per 100 cc.). From the nature of the curves obtained, it appeared that the uptake of the lactoflavin was not only a matter of adsorption but was influenced by certain processes of solution in the protein. In very low concentrations of lactoflavin anomalies occurred, apparently due to swelling of the protein. A suitable experimental

procedure is described for determining and eliminating these influences. Studies on flavin-saturated muscle fiber in water solution showed that the separation of the dyestuff was largely reversible. In acetone-water mixtures this elution took place much faster. Under the conditions of the experiment, this reversible uptake showed no particular relation to pH except in the flocculation (heat denaturing) of water solutions of flavin-bound proteins. Deproteination experiments on protein-flavin solutions showed that in protein coagulation the solid phase, as well as the deproteinated solution, often held significant quantities of flavin. The importance of nonspecific protein-flavin compounds in the transport and exchange of lactoflavin in the organism in the biological evaluation of protein materials and in analytical investigations on flavin is discussed.

Observations with the luminescence microscope on the behavior of vitamins in the living organism.—Vitamin B$_2$ in the liver [trans. title], A. HIRT and K. WIMMER (*Klin. Wchnschr., 18 (1939), No. 21, pp. 733–740*).—The fluorescence of lactoflavin in ultraviolet light served as a basis for observing its presence in organs in vivo and in section. In these studies the livers of animals were observed after intravenous injection of lactoflavin and of lactoflavinphosphoric acid and after the administration of these compounds orally or by multiple subcutaneous injections. Rats and frogs served as experimental animals in these tests. The livers of rats suffering B$_2$-avitaminosis and those of rats in the first weeks of life were also observed. Diffuse green fluorescence of the blood serum and of the liver, respectively, was taken to indicate an enrichment in lactoflavin. Excretion of the lactoflavin in the bile capillaries and retention of some of the compound in the liver cells was evidenced by a light green fluorescence in these structures, this fluorescence fading under continued irradiation, however, since free lactoflavin is labile with respect to ultraviolet light. The presence of a fluorescent, yellowish-white, light-labile compound in the Kupffer cells was taken as evidence of the presence of lactoflavin, bound probably as a protein complex. This substance gave no red fluorescence upon introducing trypaflavin through injection. The conversion of lactoflavin into other types of bound compounds apparently occurred in the liver cells, since reaction with injected trypaflavin resulted in the formation of particles with a bright red fluorescence fading under ultraviolet irradiation. Observations on the blood serum, the liver cells, the bile capillaries, and the Kupffer cells, taken at graded time intervals following the various adminisrrations of lactoflavin, are tabulated, and the findings are discussed.

Observations with the luminescence microscope on the behavior of nicotinic acid and nicotinic acid amide in the living organism [trans. title], A. HIRT and K. WIMMER (*Klin. Wchnschr., 18 (1939), No. 22, pp. 765–767*).—Continuing the study noted above, the fate of nicotinic acid or its amide was followed histologically in vivo and in section, after intravenous injection in the frog or after subcutaneous injection in the rat. The various organs were observed, the presence of a diffuse green fluorescence stable to ultraviolet irradiation indicating the presence of free nicotinic acid or nicotinic acid amide. Coarse light-stable fluorescent granules and droplets of the same color were indicative of the presence of the nicotinic acid or its amide in complex compounds bound with some nonspecific protein carrier. The nicotinic acid or the amide was found present, either free or bound or in both forms, in all of the organs studied. It was found possible to differentiate between the light-stable nicotinic acid and its derivatives and the light-labile lactoflavin and its derivatives. In the heart there appeared to be an antagonistic action between the free lactoflavin and the free nicotinic acid, since an increase in the former resulted in a parallel decrease in the latter. This same antagonistic effect was

noted in most organs of rats during the first few days of life. There was also evidence that a special relationship existed between nicotinic acid and lactoflavin in the adrenal cortex, both of these compounds having a special affinity for this cortical layer.

Nicotinic acid, B. W. Fairbanks and E. Curzon. (Univ. Ill.). (*North Amer. Vet., 20 (1939), No. 11, pp. 17–22*).—A brief review, with special reference to the requirements and physiological effects of this factor for man, dogs, swine, and monkeys. A bibliography of 35 references is included.

***The concentration of coenzyme-like substance in blood following the* administration of nicotinic acid to normal individuals and pellagrins,** H. I. Kohn (*Biochem. Jour., 32 (1938), No. 12, pp. 2075–2083, figs. 4*).—The V-factor of hemophilic bacteria is considered to be distinct from nicotinic acid or its amide but to represent the coenzyme moiety (di- and triphosphopyridine nucleotides) and possibly closely related substances. Since the factor is essential for cell respiration, its effect on the growth of standardized bacterial cultures may be used as a bio-assay procedure. In the present study a pure strain of the test organism *Hemophilus parainfluenzae* was inoculated in broth. The effect of various additions of blood extract on the growth of the culture as compared with the effect of varying amounts of the V-factor standardized solution was followed by measuring the increase in optical density of the resulting suspensions. The change in light transmission effected by increase in optical density was measured by the Evelyn photoelectric colorimeter. The test solutions represented extracts of blood samples obtained from normal individuals on a normal and later on a pellagra-producing diet and from pellagrins. Blood samples were withdrawn from both groups during periods of nicotinic acid therapy as well as in periods preceding and following this therapy. The V-factor standard solution represented a dilute KH_2PO_4 etxract of yeast. Comparing the effect of the blood extracts on the growth of the test organism in broth culture with the effect produced by an equal volume of the V-factor standard, the author concludes that the V-factor is confined to the corpuscles and further that nicotinic acid therapy amounting to 20 mg. per kilogram body weight for a period of from 1 to 10 days will increase the V-factor by from 35 to 75 percent.

Riboflavin deficiency in human subjects, V. P. Sydenstricker, L. E. Geeslin, C. M. Templeton, and J. W. Weaver. (Univ. Ga.). (*Jour. Amer. Med. Assoc., 113 (1939), No. 19, pp. 1697–1700, figs. 8*).—Case reports are given on six patients, five presenting lesions corresponding to those described by Sebrell and Butler[3] as typical of riboflavin deficiency and the sixth presenting atypical dermatitis of the hands. Five of the six patients showed evidence of pellagra or were known to be chronic pellagrins, and one of these was cured of cheilitis and of pellagrous lesions under treatment with nicotinic acid and an ample diet. All others responded to riboflavin therapy. In the presence of an inadequate diet, nicotinic acid given concurrently with the riboflavin had no adjuvant effect. Large doses of riboflavin were found to be more effective in all cases, and parenteral administration seemed much more efficient than oral.

The factor I (vitamin B_6) requirement of the rat, M. K. Dimick and C. B. Schreffler (*Jour. Nutr., 17 (1939), No. 1, pp. 23–29, figs. 3*).—The requirement of rats for factor I (vitamin B_6) was estimated, from growth experiments on graded doses of the crystalline vitamin in addition to a basal diet considered to supply all other factors, to be about 10 μg. daily. There was slight but recognizable response to as little as 1 μg. In paired tests in which the rats receiving factor I were limited in their food intake to that of paired controls on the deficient diet, the former appeared to utilize food more efficiently as

[3] Pub. Health Rpts. [U. S.], 53 (1938), No. 52, pp. 2282–2284.

evidenced by greater gains in weight and the presence of fat in the tissues. The thymus in rats on the factor I-deficient diet was found to atrophy more quickly than in those receiving the same amount of food with factor I.

Concerning the vitamin C content of honey [trans. title], E. BECKER and R. F. KARDOS (*Ztschr. Untersuch. Lebensmtl., 78 (1939), No. 4, pp. 305–308, fig. 1*).—Biological tests and iodine and dichlorophenolindophenol titration tests with various honeys (chiefly chestnut and buckwheat) led to results interpreted to indicate that the reducing constituent of honey is not vitamin C.

Honeys containing vitamin C [trans. title], C. GRIEBEL and G. HESS (*Ztschr. Untersuch. Lebensmtl., 78 (1939), No. 4, pp. 308–314*).—Thyme and mint honeys were found to exert a strong reducing action on iodine and on dichlorophenolindophenol. This effect is ascribed to their ascorbic acid content, this constituent having been separated and identified in the form of 2,4-dinitrophenyldihydrazone. It is considered that buckwheat honey undoubtedly contains ascorbic acid, but only in minute quantities.

Vitamin C in black-currant juice, W. H. A. ELLIOTT (*Brit. Med. Jour., No. 4111 (1939), pp. 830, 831*).—Attention is called to the unusually high content of vitamin C in black currants. A sirup prepared from the freshly expressed juice of matured black currants is said to have a vitamin C content of 77 mg. per 100 cc. by volume, or 61 mg. per 100 gm. by weight. Other analytical values reported for this sirup are sugars—fructose 25.4 percent, glucose 26.0, and sucrose 1.7 percent; ash 0.36 percent; and iron 11 p. p. m.

Role of manganese in the biological synthesis of ascorbic acid, M. N. RUDRA (*Nature [London], 143 (1939), No. 3628, Sup., p. 811*).—The announcement is made that manganese is a determining factor in the synthesis of ascorbic acid from mannose or glucose by rat tissue, as demonstrated by Guha and Ghosh (E. S. R., 73, p. 727) and later refuted by others. In in vitro experiments conducted by the author a manganese concentration of from 0.001 to 0.0005 percent in the incubating mixture was found most favorable for the synthesis of ascorbic acid. In in vivo experiments synthesis was effected when the mannose solution given intravenously contained 0.001 percent of manganese as the chloride. In vitro synthesis was also obtained with galactose but to a lesser extent.

A defect in the metabolism of aromatic amino acids in premature infants: The role of vitamin C, S. Z. LEVINE, E. MARPLES, and H. H. GORDON. (Cornell Univ.). (*Science, 90 (1939), No. 2348, pp. 620, 621*).—Five male premature infants were placed shortly after birth on diets of powdered cow's milk of adequate caloric, fluid, and protein content, supplemented with 20 drops of percomorph oil daily for vitamins A and D but without added vitamins B and C. For definite but varying periods vitamin C was administered parenterally in doses ranging from 50 to 200 mg. daily. Complete 24-hr. urines were examined at intervals for hydroxyphenyl derivatives calculated as tyrosine.

The values before treatment with ascorbic acid were high and were promptly lowered following treatment except in the one subject receiving only 50 mg. When this dose was raised to 100 mg. a prompt response followed. Analysis of the blood of three of the infants for ascorbic acid showed no evidence of ascorbic acid before its administration and low values even after the vitamin had been administered in amounts sufficient to depress the excretion of hydroxyphenyl compounds. The evidence is thought to suggest that the metabolic disturbance in nitrogen metabolism occasionally found in premature infants is an interrelated function of the level of intake of the aromatic amino acids, phenylalanine and tyrosine, and the degree of saturation of the tissues with vitamin C. "The spontaneous occurrence of hydroxyphenyl compounds in the

urine of premature infants fed cow's milk deficient in vitamin C affords the opportunity to studying the intermediary metabolism of aromatic amino acids in the growing human organism."

The control of experimental alcaptonuria by means of vitamin C, R. R. Sealock and H. E. Silberstein (*Science, 90 (1939), No. 2344, p. 517*).—In experiments on guinea pigs and tests on two normal human subjects ascorbic acid has been shown to be effective in preventing the excretion of homogentisic acid characteristic of alcaptonuria. It was also noted that *d*-tyrosine caused the excretion of homogentisic acid by guinea pigs, but not to the same extent as the natural isomer, and that as yet it has been found impossible to prevent the excretion of homogentistic acid by an amount of ascorbic acid which completely checks its production from *l*-tyrosine. "The effectiveness of ascorbic acid in influencing the metabolism of tyrosine so as to prevent the excretion of homogentisic acid not only throws new light upon the physiology of this vitamin, but furnishes an extremely useful tool in further studies on the intermediary metabolism of the amino acids phenylalanine and tyrosine."

A simple preventive method for the estimation of vitamin D by direct measurement of the width of the metaphysis, P. Schultzer (*Quart. Jour. Pharm. and Pharmacol., 12 (1939), No. 1, pp. 66–74, figs. 2*).—Continuing the study on preventive (as opposed to curative) methods for estimating vitamin D (E. S. R., 70, p. 882), a method was developed wherein the response of rats receiving doses of the test material along with the rachitogenic diet over a period of 28 days is compared with the response of similar groups of rats receiving graded doses of the international vitamin D standard. The degree of rickets is estimated by measuring the approximate width of the metaphysis at the upper end of the cut tibia. Preliminary experiments indicated that the width of the metaphysis is inversely proportional to the logarithm of the dose of vitamin D. In the procedure adopted, therefore, vitamin D is fed at several levels and a curve (straight line) is established, showing the relation between the width of metaphysis, taken as the average value for the group of animals receiving the dose, and the dosage (log (100×dose)). Groups of rats are likewise fed at two different levels of the preparation to be tested, and the widths of metaphyses developed are read against the standard reference curve to obtain the proper vitamin value. "In this way the vitamin content of six different preparations was found; the two results emerging from each experiment showed good agreement. The higher figure ranged from 7 percent to 17 percent above the lower."

Effect of a dietary supplement on ossification of the bones of the wrist in institutional children.—II, Effect of a cod liver oil supplement, V. MacNair (*Amer. Jour. Diseases Children, 58 (1939), No. 2, pp. 295–319, fig. 1*).—In continuation of this series (E. S. R., 80, p. 707), progress in the development of bone, as indicated by changes in the Carter ossification ratio, was followed in 67 normal children, including 19 pairs, each made up of a control and an experimental partner matched at the beginning for sex and stage of bone development. Half of the children were kept on a good institutional diet as controls and the other half received in addition a dessertspoonful of cod-liver oil daily. Roentgenograms of the right hands and forearms were taken at the beginning and the end of the calendar year.

By all methods of comparison, the group given the supplement showed somewhat greater progress than did the control group. Although about one-third of each group were retarded in respect to the Carter norms and were still retarded at the end of the study, the group given the cod-liver oil supplement reduced and the group without the supplement somewhat increased their deficits.

Although the institution diet appeared to be good, it was apparently susceptible to improvement, since the daily addition of a dessertspoonful of cod-liver oil seemed to be a factor of safety and a protection for the process of bone growth.

Observations on the pathology of rickets, with particular reference to the changes at the cartilage-shaft junctions of the growing bones, E. A. PARK (*Bul. N. Y. Acad. Med., 2. ser., 15 (1939), No. 8, pp. 495–543, figs. 12*).—The greater part of this Harvey Society lecture consists of a detailed description, with references to the literature and to the author's own investigations (which are illustrated by numerous drawings and microphotographs) of the progressive changes taking place at the cartilage-shaft junctions in experimental rickets of varying degrees in rats and in human rickets. Particular emphasis is given throughout to the recent studies of Dodds and Cameron (E. S. R., 81, p. 747) "which have yielded greatly needed precise information." A list of 34 literature references is appended.

Dental caries among Eskimos of the Kuskokwim area of Alaska.—III, A dietary study of three Eskimo settlements, T. ROSEBURY and M. KARSHAN (*Amer. Jour. Diseases Children, 57 (1939), No. 6, pp. 1343–1362, fig. 1*).—Dietary habits of three Alaskan settlements are described, and estimates of their food consumption, based on dietary surveys, are reported. Of the three settlements, one (Kepnuk) is primitive and isolated and but little dental caries was found there; another (Eek) is primitive but has a resident white trader, and much dental caries was found; while a third (a Moravian orphanage) presented an intermediate incidence of dental caries despite the most extensive influence of the white man's diet.

Original data are presented on calcium and phosphorus and proximate constituents of many of the native foods. These analyses and certain compiled data are applied to the consumption estimates in calculating the dietary intakes of calcium, phosphorus, protein, fat, and carbohydrates. The incidence of dental caries at the three settlements could not be correlated, however, with any of these intakes or with the consumption of cereal grain foods, the probable vitamin D intake, or the potential reaction of the diet. More sugar was used at Eek where dental caries was prevalent than at the other two settlements, but its importance as the primary cause of dental caries is considered doubtful, since its use at Eek was chiefly in the dissolved form (in tea). The only other food considered of probable significance was pilot bread or ship biscuit, the use of which was correlated with the prevelance of dental caries at the three settlements. In experimental studies with rats this bread, like coarse raw cereal, was found capable of producing fissure caries and proximal contact caries. It is postulated, therefore, that this type of food is primarily responsible for dental caries in the young person.

Domestic water and dental caries, including certain epidemiological aspects of oral L[actobacillus] acidophilus, H. T. DEAN, P. JAY, F. A. ARNOLD, JR., F. J. McCLURE, and E. ELVOVE (*Pub. Health Rpts. [U. S.], 54 (1939), No. 21, pp. 862–888, figs. 4*).—The present study was undertaken to obtain further information on the differences in the amount of dental caries associated with the use of public water supplies of dissimilar types (E. S. R., 81, p. 154). The survey was made in four Illinois cities, namely, Macomb and Quincy, with water supplies practically free from fluorides (only about 0.2 p. p. m), and Galesburg and Monmouth, with water supplies containing about 1.8 and 1.7 p. p. m. of fluorides and producing a mild degree of mottled enamel in an appreciable percentage of those using the water during the period of susceptibility. Chemical analyses of the water supplies of these four cities are reported. In the survey 12-, 13-, and 14-year-old white public school children

whose permanent teeth had been continuously exposed to the influence of the water under investigation were examined to determine the incidence and amount of dental caries.

The 112 children examined in Macomb and the 306 in Quincy showed, respectively, 401 and 633 carious permanent teeth per 100 children in contrast to the lower rates of 201 and 205 in the 319 and 148 children examined in Galesburg and Monmouth, respectively. In the latter two cities about 35 percent of those examined were caries free with respect to their permanent teeth, whereas only 14 and 4 percent of those in Macomb and Quincy, respectively, were free from dental caries. At Galesburg there was no significant difference in the amount of caries between those children with mottled enamel and those without it. Quantitative estimation of the amount of oral *L. acidophilus* in the saliva of 186 children in Galesburg and 209 in Quincy indicated that the percentage of bacteriological counts of 30,000 or over was 3.4 times higher in Quincy than in Galesburg. The quantity of amylase secreted in the saliva disclosed no group population differences between Galesburg and Quincy.

From an epidemiological standpoint it is considered difficult to ascribe the observed differences in percentage incidence and amount of dental caries to any cause other than the common water supply. It is pointed out, however, that while the low dental caries rates seem to be associated with the higher fluoride content, the possibility that other differences in the composition of the waters may be a factor should not be overlooked.

A comparison of the toxicity of fluorine in the form of cryolite administered in water and in food, M. LAWRENZ, H. H. MITCHELL, and W. A. RUTH. (Univ. Ill.). (*Jour. Nutr., 18 (1939), No. 2, pp. 127–141*).—The paired feeding technic was employed, and balance trials of 14 days each were carried out. In addition, bones, teeth, and soft tissues of all rats were analyzed at the termination of the feeding period. The fluorine was fed in amounts equivalent to 10 p. p. m. of solid food, 9 percent of the fluorine intake being contained in the basal diet in unknown forms. At the low level of intake, the method of administration, whether in water or in food, had no apparent effect on the rate of growth of animals. Striations in the lower incisor teeth resulted at approximately the same time from the administration of fluorine in food or in water. Fluorine administered in the food was retained to a less extent (about 20 percent) than fluorine given in the drinking water. Apparently there was impairment in absorption from the alimentary tract.

"Considering both the difference in the usual consumption of food and of water in practical human nutrition and the difference in potential toxicity of fluorine in water and in food, a concentration of 1 p. p. m. of fluorine in the drinking water defining the upper limit of safety is the hygienic equivalent of from 2.4 to 4.8 p. p. m. of fluorine in the total food, depending upon the proportion of the water intake that contains fluorine in the critical concentration."

Experimental chronic cadmium poisoning, R. H. WILSON and F. DEEDS. (U. S. D. A. et al.). (*Science, 90 (1939), No. 2343, p. 498*).—This note describes three marked symptoms of toxicity resulting from the inclusion of small amounts of cadmium in the diet of rats. The cadmium was fed at five levels, varying from 0.0031 to 0.05 percent of the diet. Bleaching of the enamel of the incisor teeth, similar to that produced by fluorides, occurred at all levels of cadmium feeding. Also an anemia was produced at all dosage levels, the severity increasing with the percentage of cadmium in the diet. The

third symptom was a cardiac hypertrophy, which is believed to be primarily due to the anemia rather than to hypertension resulting from kidney damage.

TEXTILES AND CLOTHING

Textiles and clothing [at the Bureau of Home Economics] (*U. S. Dept. Agr., Bur. Home Econ. Rpt., 1939, pp. 13–18*).—This annual report (E. S. R., 80, p. 716) summarizes data from the Division of Textiles and Clothing on the *preparation of consumer buying guides* (E. S. R., 81, p. 461); *of the suitability of fiber to purpose in the manufacture of cotton sheets* (E. S. R., 81, p. 602) and cotton hosiery; the physical and chemical changes in awning fabrics caused by micro-organisms; and in the measurement studies for sizing children's garments and patterns (E. S. R., 82, p. 430).

Physical testing in the textile industry, E. J. SAXL (*Amer. Dyestuff Rptr., 28 (1939), No. 21, pp. P615–P618, figs. 8*).—Various instruments for testing some of the physical characteristics of textile materials are effectively illustrated, and the principles of operation are discussed briefly. The instruments are those making possible evaluation of the factors of stiffness, softness, crush resistance, elasticity and elastic recovery, breaking strength and yield point, yarn tension (in spinning), yarn twist, waterproofness, and porosity.

Group C-fastness tests for dyed or printed cotton.—I, Fastness to laundering or domestic washing of dyed or printed cotton (with Launder-Ometer) (*Amer. Dyestuff Rptr., 28 (1939), No. 12, pp. P312–P314*).—Official methods for fastness to washing of dyed cotton material, as revised by the committee of the American Association of Textile Chemists and Colorists in cooperation with different interests, are presented. These methods are given in detail with regard to samples of material, reagents, and test methods. The five classes of fastness to washing distinguishable by these test methods are defined, and the standard dyed samples established for guides as to what constitutes a satisfactory degree of fastness to pass a given test are prescribed.

[Wool fiber diameter relationships] (*South Dakota Sta. Rpt. 1939, pp. 52, 53*).—Included in this progress report (E. S. R., 81, p. 318) are summaries of studies by B. Bailey on fiber diameter relationships of wool from five breeds of sheep raised in the State.

Quantitative microscopical analysis of mixed fabrics, H. M. FLETCHER. (Kans. Expt. Sta.). (*Amer. Dyestuff Rptr., 28 (1939), No. 21, pp. 624–626, figs. 3*).—The basic formula for calculating the percentage of each kind of fiber in a mixture is taken as $(100\ n_a g_a)/(n_a g_a + n_b g_b)$ where n equals the number of fibers, g represents the weight of the fiber per unit length, and a and b refer to the particular kinds of fiber in the yarn. In the present method the formula is modified to obviate the necessity of determining weight per unit length, a value representing cross sectional area of the fiber times its specific gravity being substituted for g. To determine the cross sectional areas of the several kinds of fiber in a mixture, a cross section of the yarn is observed under the microscope, a magnification of about 300 with a 4-mm. objective being used. The relative areas of the fibers are found by drawing for each one 10 or more cross sections with the camera lucida. The sections are cut out and weighed on an analytical balance, the average weight of the paper drawings of each kind of fiber being taken as proportional to the size of the fiber. The percentage by volume of a fiber (A) in a blend is expressed by the formula $(100\ n_a w_a)/(n_a w_a + n_b w_b)$, and the percentage by weight by the formula $(100\ n_a w_a g_a)/(n_a w_a g_a + n_b w_b g_b)$ where n is the number of fibers, w the average weight of the camera lucida drawings of the cross sections, and g the specific gravity of the fiber as taken from

standard tables. The number of fibers of a given kind is ascertained by averaging the actual counts made in 10-20 microscopic fields of equal size. For blends (viscose rayon, linen, cotton) not readily sectioned, counts are made from teased microscopic mounts (in glycerin) of yarn lengths of less than 1/16 in. Results of microscopical analyses by weight in comparison with chemical analyses are presented for various blends, such as those of viscose rayon and wool, wool and cotton; silk, wool and rabbit fur, the two methods showing good agreement. Results of microscopic analysis are also given for blends of viscose rayon and linen and of wool and rabbit fur.

A study of the values sought and the practices followed by consumers in the purchase of "silk" street dresses and silk yard goods, E. L. Phelps, F. E. Petzel, A. S. Loring, and E. A. Nielson (*Minnesota Sta. Misc. Rpt. 1 (1939), pp. 15*).—The plan of the investigation and a report of what consumers actually bought were presented earlier (E. S. R., 81, p. 885). The present contribution deals with the factors and reasons influencing the choices made by consumers and the practices relied on to get what they wanted. The findings indicated that although consumers may know what values they want they are not able in many cases to obtain goods that give maximum satisfaction. This is due in part to the limited training of the consumer, in part to the lack of authoritative standards of qualities that provide a scientific basis for selection, and in part to the lack of informative labeling by the manufacturer. The authors list a number of points that might well be considered in order to achieve greater returns for each clothing dollar spent.

Clothing consumption of 299 village and 551 farm families in Vermont, M. E. Tiffany (*Vermont Sta. Bul. 451 (1939), pp. 48*).—This study was conducted as a part of the large-scale cooperative "study of consumer purchases" (E. S. R., 82, p. 572). The data, obtained by personal interviews and pertaining for each economic family to a schedule year of 12 consecutive months between January 1, 1935, and October 31, 1936, are tabulated in numerous tables that give various classifications of the families, of the family members, and of the clothing expenditures. From the findings, discussed at length, the following conclusions are drawn:

"The clothing expenditures made by 299 village and 551 farm families in Vermont in 1935-36 account for 8 and 11 percent, respectively, of their total monetary outlays for family living, being exceeded by those made for food and automobile and, in the case of the village families, for household operation and for housing as well. Clothing costs increased with rising levels of cash income and with increasing numbers in the family. The women spent but little more than did the men for clothing. About one-fifth of the average outlay was made for footwear, about one-sixth each for underwear and for coats and wraps, and about one-third for other outer garments. Relatively little was spent for headwear, accessories, or for other items. Expenditures per person for clothing of all sorts tended to increase with the age of the consumer."

HOME MANAGEMENT AND EQUIPMENT

[Home management studies by the Illinois Station] (*Illinois Sta. Rpt. 1937, pp. 315-327, figs. 2*).—This progress report (E. S. R., 78, p. 286) summarizes the analysis, by R. C. Freeman, of 240 farm and 80 town family home accounts for income and distribution of expenditures and of 77 farm family record books kept over a continuous 5-yr. period.

Toward higher levels of living (*U. S. Dept. Agr., Bur. Home Econ. Rpt., 1939, pp. 1–4*).—This is a brief discussion of the long-time program of the Bureau of Home Economics.

Economic studies [at the Bureau of Home Economics] (*U. S. Dept. Agr., Bur. Home Econ. Rpt., 1939, pp. 4–9*).—This portion of the Bureau report (E. S. R., 80, p. 717) consists chiefly of a comparison, based upon data from the consumer purchases study (E. S. R., 78, p. 735), of the patterns of family living of farm and city families concerning income, use of modern conveniences, and income use.

Housing and equipment [at the Bureau of Home Economics] (*U. S. Dept. Agr., Bur. Home Econ. Rpt., 1939, pp. 18–20*).—This annual report (E. S. R., 80, p. 717) of the division of housing and equipment includes a brief discussion of the results obtained in a preliminary study of electric roasters.

MISCELLANEOUS

Report of the Secretary of Agriculture, 1939, H. A. Wallace (*U. S. Dept. Agr., Sec. Agr. Rpt., 1939, pp. IV+169*).—The principal findings in this report are noted elsewhere in this issue.

A year's progress in solving farm problems of Illinois: [Fiftieth Annual Report of Illinois Station, 1937], compiled and edited by F. J. Keilholz (*Illinois Sta. Rpt. 1937, pp. 351, figs. 74*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Fifty-second Annual Report of the [Michigan Station], 1939, V. R. Gardner (*Michigan Sta. Rpt. 1939, pp. 95–107*).—This consists mainly of lists of publications and projects.

Farm research in South Dakota: Fifty-second Annual Report [of the South Dakota Experiment Station, 1939], I. B. Johnson et al. (*South Dakota Sta. Rpt. 1939, pp. [2]+79, figs. 18*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

The analysis of variance with special reference to data expressed as percentages, A. Clark and W. H. Leonard. (Colo. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 1, pp. 55–66, fig. 1*).—Discrete data representing counts of a given type, condition, or attribute and based on a determinate number of trials evidently should be subjected to the transformation $p = \sin^2 \theta$ (suggested by R. A. Fisher) where it is proposed to combine them in any way to construct a generalized standard error. Mathematical development of the above transformation based upon the need for equalizing variances is presented, and percentage data in general are classified into three types to indicate when to use this transformation. Data under imposed sources of variation should be subjected to a homogeneity test when the combined data are to be treated by an analysis of variance. Certain reasons for the heterogeneity of variances sometimes resulting under several variants of an imposed source of variation are shown. It is also indicated through illustration that even though data in their entirety exhibit such heterogeneity as to make an analysis of variance invalid, the data may be eliminated under certain variants of a source of variation and most of the data still combine for determination of a valid generalized standard error with but little loss of information and generality.

NOTES

Connecticut University and Storrs Station.—The university orchard, set out in 1900, has been removed, and the area will be replanted as a research orchard. Replicated plats will be used so that a comparison can be made of different soil management treatments, hardy stocks, and variety studies of both apples and peaches, as well as pruning and thinning tests. Dr. Wesley P. Judkins, who was appointed assistant professor of pomology, is devoting most of his time to the development of plans for this project.

Purdue University and Indiana Station.—Dr. C. R. Donham, professor of veterinary science at Ohio State University and associate in animal industry in the Ohio Station, has been appointed head of the department of veterinary science.

Maine University.—A conference of the entomologists of Maine and the Canadian Maritime Provinces was held at the university January 17 and 18. The conference dealt largely with problems concerning insects affecting truck crops, forest and shade trees, and orchard and small fruits. A decision was reached to continue the conference as an annual event.

J. Robert Smyth has been appointed head of a newly created department of poultry husbandry.

Massachusetts College.—A department of bacteriology has been established with Dr. Leon A. Bradley as head.

Minnesota University and Station.—Dr. Willard L. Boyd, a member of the division of veterinary medicine since 1911, has been appointed chief of that division as successor to the late Dr. C. P. Fitch.

Missouri Station.—The station is undertaking a comprehensive project on the factors that determine the development of chinch bugs. Information is greatly needed in the Middle West to determine the various weather, cover, and cropping conditions which result in the irregular development of chinch bug scourges in different parts of the country. Philip C. Stone has been appointed to give full time to this project during the ensuing year.

Montana College and Station.—Dr. H. F. Hollands, associate agricultural economist in the Washington Station, has been appointed professor of agricultural economics. Fred S. Willson has been appointed superintendent of the North Montana Substation at Havre.

North Carolina Station.—A farm of 130 acres has been purchased with State funds near Statesville in Iredell County, to be used for dairy research.

During 1939 the station examined and appraised more than 5,200 soil samples for North Carolina farmers. Definite lime and fertilizer recommendations were made for the crops indicated to be grown on each soil.

An outstanding accomplishment of the horticultural section was the development of Sequoia, a new late Irish potato which has produced high yields and shown remarkable resistance to insects and diseases.

Ohio State University.—Dr. Carl W. Gay has resigned as chairman of the animal husbandry department, effective July 1, after which date he will give full time to classroom teaching.

Pennsylvania College and Station.—Esther M. Chapman has been appointed instructor in textiles, to succeed Anne B. Searle, resigned.

Rhode Island Station.—Dr. B. E. Gilbert has been appointed acting director, effective March 15.

South Dakota College and Station.—A substation council is being formed for each of the four substations and composed of one active farmer or stockman from each of the counties adjacent to them.

A large group of stockmen attended the second annual Sheep Feeders' Day held at the station February 16. The attendance was estimated as about twice that in 1939. Sponsored by the station, the day is designed to review the experimental work, as well as present other practical suggestions to the sheep feeder.

Dr. Leo F. Puhr, who has been on leave of absence culminating in the granting of the Ph. D. degree by the University of Wisconsin in January, has been appointed associate professor in charge of soil investigations.

Texas Station.—Recent appointments include Dr. Charles E. Minarik, plant physiologist in rice investigations at Beaumont, and Dr. Glenn KenKnight, plant pathologist, who will conduct investigations of peanut, cantaloup, and watermelon diseases at Stockdale.

Vermont Station.—A new dairy barn to replace the one lost by fire in August 1939 and to house 66 cows and over 50 head of young stock is nearing completion. It is a one-story structure with no hay storage above the cattle. The frame is of wood, with self-supporting roof trusses and without inside posts, and the walls inside and out and the roof are covered with different fireproof materials. Providing a basis for various comparative tests as to suitability, cost, efficiency, durability, and upkeep, five or more kinds of materials are being used for each of the following: Roofing, outside wall surfaces, insulation, inside wall and ceiling surface, and floors. Numerous thermocouples and electrical resistance points are also being installed to facilitate the taking of temperature and moisture records over a series of years.

The deaths on March 2 and March 4 are noted of John D. Erit and Leslie E. Davis, assistant chemists for 5 and 4 years, respectively. Both were recent graduates of the university and aged 28 and 33 years.

Virginia Station.—Mary C. McBryde, assistant in plant pathology, has resigned as of December 11, 1939.

Washington Station.—Dr. J. B. Moore, assistant entomologist at the Wenatchee Substation, has resigned to engage in commercial work, and has been succeeded by William J. O'Neill. Dr. L. G. Nicholson has been appointed assistant veterinarian vice Dr. R. H. Hurt, resigned to accept an assistantship in the University of Illinois. Morris Rhian has been appointed assistant chemist vice Dr. E. P. Painter, resigned to become chemist in the North Dakota Station.

West Virginia Station.—A $12,000 fireproof barn replacing the one destroyed by fire in 1937 has been completed at the Raymann Memorial Experimental Farms at Wardensville. Constructed in two units—one to house the cattle, the other to be used entirely for hay storage—the barn provides space for approximately 35 cows and heifers. The building is constructed of tile and concrete, with metal roofs and ceiling, and is ventilated electrically.

Wisconsin University and Station.—A new wing of the biochemistry building has been completed at a cost of $250,000. The wing is a three-story structure, 52 by 134 ft., and will be devoted to research and graduate teaching in the chemistry of animal nutrition, plant nutrition, and fermentation. The erection of the unit was made possible by a grant from the Wisconsin Alumni Research

Foundation, and it was built with the aid of the U. S. Public Works Administration. A distinctive feature made possible by private funds is the embellishment of the walls in the entrance hall and seminar room by a series of mural paintings. These paintings will be made by John Steuart Curry, artist in residence in the university, under a gift from the Brittingham Trust Fund, the income of which was bequeathed to the university. About 750 sq. ft. of wall space is available, and will be used to depict the achievements of biochemistry in making available new information concerning animal nutrition, particularly as regards the vitamins and the role of mineral elements.

New Journals.—*Scientia Genetica* is being published under the sponsorship of the Lazzaro Spallanzani Institute of Zoology of the University of Pavia, Italy. Its objective is the promotion of genetics research in the Latin group of nations. Issued in 4 numbers aggregating at least 400 pages per year, it will cater to research on heredity and variability from these nations, but will also publish material along these and related lines from other countries if made available in French, Italian, Spanish, or Portuguese. All articles will be followed by summaries in Latin, English, and German. The initial number contains eight articles, among them Genetical Review of Melopsitte *Melopsittacus undulatus* (Shaw)), by F. A. E. Crew; The Sex Ratio in *Drosophila*, by T. Dobzhansky; Effect of Heat on Microsporogenesis in *Secale cereale*, by A. Camara; and The Importance of Certain Loci to the Organism, by M. Demerec.

International Journal of Agrarian Affairs is being published semiannually by the Oxford University Press, London. L. K. Elmhirst, President of the International Conference of Agricultural Economists, announces in a foreword that the object is the provision of a medium for the continuous interchange of ideas during the intervals between the biennial sessions of the conference. The initial number has for its theme The Problem of Surplus Agricultural Population, with contributions from six authors, including Drs. J. D. Black and M. L. Wilson from the United States, and Dr. J. E. Lattimer from the Dominion of Canada.

The American Biology Teacher is being published eight times a year by the National Association of Biology Teachers, of which P. K. Houdek, Township High School, Robinson, Ill., is secretary-treasurer. The initial number contains among others an article by O. Riddle entitled Biology Teachers Begin To Pull Together, and one by J. R. Byerley on The Modern Biology Laboratory.

Sillons: Revue Agraire Internationale is being published at 8, Rue de Choiseul, Paris, by the International Agrarian Center. The initial number deals with a number of problems in various countries of economic and sociological significance, including a discussion of conditions in the United States by M. Cepede.

Arquivos do Serviço Florestal is being published from time to time by the Minister of Agriculture at Rio de Janeiro, Brazil. The initial number contains Plants New or Little Known in the Amazon Region, by A. Ducke, and New Brazilian Orchids, IV, by A. C. Brade.

Indian Farming is discussed editorially on page 579 of this issue. In addition to announcements, news notes, book reviews, and the like, the initial number contains seven original articles.

EXPERIMENT STATION RECORD

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PERSONNEL CHANGES IN THE EXPERIMENT STATIONS

During the past 3 years there has been a net increase in the station and substation personnel of nearly 10 percent, raising the total staff to about 4,800. Of these, approximately 50 percent are full-time workers. About 72 percent of the total number have received advanced degrees. About 60 percent were employed in the same station 3 years ago. Relatively few were direct transfers from one station to another.

These findings are based on an analysis of the publication recently prepared in the Office of Experiment Stations entitled Workers in Subjects Pertaining to Agriculture in Land-Grant Colleges and Experiment Stations, 1939–40. This publication, a continuation of a series of long standing, is intended primarily as a directory, but it also contains much material of interest as to the personnel set-up of the stations. Some variations in the compilation procedures occur from year to year, but of late there has been sufficient uniformity for statistical treatment, and a number of comparisons and deductions are obtainable with an expectation of at least approximate accuracy.

Using as a basis the reports issued in the spring of 1937 and 1940 and covering in a general way the personnel status up to about February 1 of the respective years, it appears that about 2,900 names are recorded for substantially the same positions as 3 years before, that about 375 names are associated with the same stations but show advancement to higher positions, and that about 1,500 names are new to the stations from which they are now reported. Since the net increase in total personnel has been about 400, a considerable turnover and an appreciable influx of new blood is indicated.

In the early years of the stations, a large proportion of both vacancies and new positions were filled by transfers from other stations. One of the somewhat surprising findings in the present analysis has been the limited number of such transfers under existing conditions. A total of only 124 transfers were recorded for the 3-year period, which is less than 1 per station per year. The largest number so added for any station was 8; 11 stations acquired only 1 staff member each in

this way; and 11 took on no transfers whatever. Under these circumstances it appears that interruption of continuity of projects from this cause is assuming relatively minor importance. A larger number of the new station workers were already employed at the same institution in instruction or extension, which duties they usually still continued in part. Probably the main source of supply for full-time subordinate positions is now the graduate school.

Because of divided duties, the total effective man power of the stations is much less than the aggregate of individuals. The count shows barely 50 percent of the employees reported as full-time, but affords no basis for estimating the proportion given to station work by those who are also engaged in teaching, extension, and/or other nonstation work. As compared with 52 percent of full-time employees 3 years ago, a slight trend toward divided responsibilities is indicated. Great variation between institutions in this respect, however, is noticeable, ranging from the 100-percent full-time enrollment in those stations without instruction or extension responsibilities to a policy in one State where no full-time workers are reported in a station technical staff of 165.

A survey of the situation as regards advanced degrees reveals that in 1937 approximately 40 percent of the stations' staffs had earned doctor's degrees, while for 37 percent of the entire number the master's degree was their highest. In 1940 the proportion was again 40 percent for the doctor's degree, but only 32 percent were credited with the master's degree alone. The reason for the latter decrease is not entirely clear. It may be correlated with the addition of more staff members with the grade of assistant. On the other hand, it may be noted that there are now only 55 heads of departments, practically 1 per institution, who do not hold advanced degrees.

Further analysis of the material at hand would doubtless disclose additional details of interest. On the whole, the data indicate that the stations are continuing to make progress in overcoming some of their personnel problems of former years.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical and bacteriological investigations by the Iowa Station] (*Iowa Sta. Rpt. 1939, pt. 1, pp. 98, 99, 124, 125*).—The report contains notes on nitrogen and accessory growth factor requirements of bacteria, especially the lactic and propionic acid forms, by C. H. Werkman; and on development of the use of Iowa clay for the clarification of sorgo sirup, by W. G. Gaessler and J. T. Lonsdale.

Electrokinetics.—XXI, Electrokinetic theory—streaming potential and the electroosmotic counter effect, M. A. Lauffer and R. A. Gortner. (Minn. Expt. Sta.) (*Jour. Phys. Chem., 43 (1939), No. 6, pp. 721–732, figs. 2*).—Continuing the series (E. S. R., 81, p. 469), the results of this study support the electro-osmotic counterpressure theory. "This constitutes a second justification for applying the theory of [H.] Helmholtz to streaming potential studies involving organic liquids. The original justification is the fact that streaming potentials of such systems have been shown to be directly proportional to the pressures of streaming, as the Helmholtz equation demands."

The effective mean pore size of a cellulose diaphragm containing ethyl acetate was calculated in accordance with the back pressure theory and found to have the value 0.27μ.

Soybean protein: Precipitation from water and alkaline dispersions by acids and by electrodialysis, A. K. Smith and S. J. Circle. (U. S. D. A.). (*Indus. and Engin. Chem., 31 (1939), No. 10, pp. 1284–1288, fig. 1*).—Oil-free soybean meal was extracted with water and alkaline solutions. The proteins precipitated from these dispersions by various acids and electrodialysis were compared in respect to yield and ease of manipulation and preparation. The results indicated that electrodialysis through parchment paper offers no advantages over acid precipitation. Tannic acid may be used to recover protein not precipitated by sulfuric acid.

Does margaric acid occur in alfalfa seed oil? H. A. Schuette and H. A. Vogel. (Univ. Wis.). (*Oil & Soap, 16 (1939), No. 1, pp. 16–19, fig. 1*).—By the application of phase rule principles to the analysis of a fraction which constituted approximately 6.3 percent of the oil, it was found that this fraction was in reality not margaric acid but an equimolecular mixture of palmitic and stearic acids. It is stated that the presence of these two acids in alfalfa seed oil has not been previously reported. Indications of the presence of myristic acid and of a higher homologue (or homologues) of stearic acid were found.

Wetting and spreading properties of aqueous solutions: Mixtures of sodium carbonate with n-caproic, n-caprylic, n-capric, lauric, myristic, and palmitic acids, H. L. Cupples. (U. S. D. A.). (*Indus. and Engin. Chem., 31 (1939), No. 10, pp. 1307, 1308, fig. 1*).—For aqueous mixtures of sodium carbonate with a series of fatty acids at a concentration of 1 percent of fatty acid, the surface tension, interfacial tension against mineral oil, and spreading

coefficient, when plotted as functions of the alkali: fatty acid mol ratio, give curves which are similar in form with few exceptions. The relative positions of the curves correspond approximately with the order of increasing molecular weight of the fatty acids.

The characteristics of the carbonate mixture are similar to those of the corresponding hydroxide mixtures, with some differences which are apparently accounted for by the diacidic nature of the carbonate. The oleate mixtures have exceptional properties which help to explain their excellence as detergents.

Some observations on the determination of iron and copper in biological material by photoelectric colorimetry, W. E. Parker and F. P. Griffin (*Canad. Jour. Res., 17 (1939), No. 2, Sect. B, pp. 66–70, figs. 2*).—The dipyridyl method for estimating available iron is modified so that it can be applied directly to colored extracts of plant tissue. The modification admits of the use of the Evelyn photoelectric colorimeter, thereby eliminating the need for clarification with lead acetate and avoiding the discrepancies due to the introduction of this reagent.

By combining the dipyridyl method for iron with the carbamate method for copper, interference of iron with the copper determination is eliminated, permitting the simultaneous estimation of iron and copper in the same sample even when one is present in large excess. The dipyridyl reagent and a reducing agent are added to the solution containing both iron and copper, followed by the carbamate reagent, and extraction with isoamyl alcohol. The iron, converted to ferrous dipyridyl, is un-ionized and insoluble in the isoamyl alcohol, permitting complete separation from the copper carbamate, which is taken up by that solvent. The application of the photoelectric colorimeter to the determination of the iron in the clear pink aqueous layer and the copper in the golden-yellow alcohol layer is described in some detail.

The ionisable and available iron in foods, R. A. McCance (*Soc. Chem. Indus. [London], Chem. and Indus., 58 (1939), No. 22, pp. 528–530*).—This brief review, delivered as an address, gives critical consideration to the α,α'-dipyridyl method for ionizable iron as a means of determining the amount of food iron available for utilization by the body. The pitfalls of the method, the discrepancies between results of different workers, comparison of results by this chemical method with those obtained by biological assay, factors affecting the biological assay of available iron, applicability of findings to practical human nutrition, and problems still needing solution (including the development of a more satisfactory technic) are phases of the subject discussed.

Work with frozen foods (*Georgia Sta. Rpt. 1939, pp. 81–83, figs. 2*).—The work reported consists mainly of tests of the product and considerations concerning a medium suitable for immersion freezing of fruits and vegetables.

Industrial utilization of agricultural products (*Indus. and Engin. Chem., 31 (1939), No. 2, pp. 141–180, figs. 25*).—The 10 papers here listed, with an introduction by H. R. Kraybill, were presented as a joint symposium on this subject before the divisions of agricultural and food chemistry, biological chemistry, and industrial and engineering chemistry of the American Chemical Society, meeting at Milwaukee, Wis., September 5-9, 1938: Role of the Department of Agriculture, by H. T. Herrick (pp. 142–144), and Plastic Materials From Farm Products, by G. H. Brother (pp. 145–148) (both U. S. D. A.); Cellulosic Agricultural By-products—Possibilities for Industrial Utilization, by D. F. J. Lynch (pp. 149–153) (U. S. D. A. and Iowa State Col.); Industrial Use of Starch Products, by W. B. Newkirk (pp. 153–157); Industrial Utilization of Fats and Oils, by A. Guillaudeu (pp. 158–162); Alcohol From Farm Products,

by P. B. Jacobs (pp. 162–165), Utilization of Naval Stores, by C. F. Speh (pp. 166–168), Agricultural Products as Insecticides, by R. C. Roark (pp. 168–171), and Fermentation Processes, by P. A. Wells and G. E. Ward (pp. 172–177) (all U. S. D. A.); and Industrial Uses of Furans, by F. N. Peters, Jr. (pp. 178–180).

Preserving cider by carbonation, H. D. Brown, C. Fitzgerald, and F. Newman. (Ohio State Univ.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 371–373*).—Several lots of cider condensed to approximately 26 percent solids by freezing or in a vacuum pan were carbonated at 3.5 volumes and were kept for over a year without spoilage. It was noted that higher pressures and longer treatments are most effective in reducing the number of micro-organisms. The longer carbon dioxide treatments did not increase the acidity appreciably. None of the treatments is deemed commercially successful, since excessive pressures developed in some cans of all lots, and undesirable flavors were always associated with high pressures. In some instances, the high pressures were sufficient to burst the cans.

Gases in the commercial handling of citrus juices, G. N. Pulley and H. W. von Loesecke. (U. S. D. A.). (*Indus. and Engin. Chem., 31 (1939), No. 10, pp. 1275–1278, figs. 3*).—The oxygen content of commercially extracted citrus juices before deaeration ranged from 2.46 to 4.67 cc. per liter, reduced to standard conditions. After deaeration they contained from 0.09 to 2.39 cc. per liter. The commercial plate-type deaerators investigated were found to be greatly overloaded, with a resulting reduction in efficiency. Under the conditions of the investigations, centrifugal deaeration was found to be the most efficient of the methods examined and now being used in commercial practice in Florida. In using this type of deaerator, most efficient deaeration was obtained when the temperature of the juice was not less than 16° C., with a vacuum of at least 635 mm.

Dissolved oxygen in the juice apparently combines with some constituent or constituents of the juice, a reaction which is accelerated by elevated temperatures and may adversely affect the juice, especially its vitamin C content.

Natural aging of wine: A chemical study, E. K. Nelson and D. H. Wheeler. (U. S. D. A.). (*Indus. and Engin. Chem., 31 (1939), No. 10, pp. 1279–1281*).—When aged in vats, wines increased in volatile ester content. As a result of the precipitation of lees, there were decreases in combined acid and in color and tannin. Wines hermetically sealed in glass increased in volatile ester content during a year's storage at room temperature. There was no detectable reversible redox system at the pH of wine.

Fireproofing Christmas trees, M. Leatherman (*U. S. Dept. Agr. Leaflet 193 (1939), pp. [2]+5, figs. 3*).—Either ammonium sulfate, which is readily available, or calcium chloride, if it can be obtained, may be used for this purpose, the quantity required being one-fourth of the weight of the tree. The required quantity of either salt is to be dissolved in 1.5 pt. of water per pound of the salt, the freshly cut end of the tree trunk is to be immersed into the solution, and the tree left until all of the solution has been taken up. Cutting the end of the tree trunk at an angle or in a V shape was found to facilitate absorption of the fireproofing solution. A tree which has taken up the prescribed quantity either of ammonium sulfate or of calcium chloride "cannot be made to blaze even when exposed to a large flame," but it is emphasized that this degree of fire resistance will only be obtained when the tree is fresh enough at the time of treatment to take up the full quantity of fireproofing salt solution specified.

Cotton may be fireproofed by sprinkling with a warm solution of 7 oz. of borax, 3 of boric acid, and 1.5 oz. of soap powder in 2 qt. of water. The cotton must dry thoroughly before handling. It cannot be dipped in the solution

because of matting if it is so treated. Absorbent cotton is much more easily fireproofed than raw, but the soap must be omitted.

Bibliography on molecular or short-path distillation, S. B. Detwiler, Jr., and K. S. Markley. (U. S. D. A.). (*Oil & Soap, 16 (1939), No. 1, pp. 2–5*).—The references given cover the period from 1920 through September 1938. A brief introduction to the bibliography suggests the wide variety of applications of this comparatively recently devised technic.

A graduated pycnometer, G. R. Robertson. (Univ. Calif.). (*Indus. and Engin. Chem., Analyt. Ed., 11 (1939), No. 8, p. 464, fig. 1*).—The author constructs a Sprengel-type pycnometer by sealing the upper ends of two graduated pipettes of the contracted ends of a short, wide U-tube of a size such that the capacity of the completed instrument will be from 20 to 25 cc. He uses pipettes of a total delivery of 0.2 cc. and graduated in 0.001-cc. divisions, the portion of each pipette used being that graduated from 0 to 0.05 cc. The parts of the two pipettes above the graduations are bent outward at the angle of 45° from the vertical. Pipettes having the blue-line feature are advised, as the scales are read while the instrument is immersed in a thermostatic bath.

A new dilatometer for determining bound water in soils and other colloidally dispersed materials, T. F. Buehrer and M. S. Rosenblum. (Univ. Ariz.). (*Jour. Phys. Chem., 43 (1939), No. 7, pp. 941–951, fig. 1*).—The authors devised a new dilatomer to make possible a precise control of experimental conditions. They investigated the effect of changes in the temperature of the freezing bath and the capillary, presented a quantitative expression for the correction to be applied to the observed data, and showed that when conditions are so controlled and the proper corrections are applied to the measurements, the results obtained by any one observer are reproducible within from 1 to 2 percent.

Apparatus for determining moisture by the distillation method, A. C. Beckel, A. G. Sharp, and R. T. Miller. (U. S. D. A.) (*Indus. and Engin. Chem., Analyt. Ed., 11 (1939), No. 8, pp. 425, 426, fig. 1*).—The authors avoid the clinging of droplets of water to the walls of the condenser above the range within which the toluene condenses by substituting a downward directed condenser for the reflux of the Bidwell-Sterling apparatus (E. S. R., 53, p. 805) so that the droplets are washed down by the condensing toluene. The delivery tube of the new apparatus dips below the surface of the collecting toluene, and bumping in the distillation flask causes the liquid in the condenser tube down to the end of the delivery tube to be sucked back into the flask for redistillation about once in 10 min. This redistillation eliminates the milky suspension of water in toluene usually observed in earlier forms of apparatus for determining moisture by distillation. The distillate is collected over a column of mercury of which the height in the measuring tube is adjustable by means of a leveling bulb. A dimensioned drawing shows the construction of the apparatus.

A rapid method of checking the accuracy of reported water analyses, V. P. Sokoloff. (Calif. Citrus Expt. Sta.). (*Soil Sci., 49 (1940), No. 1, pp. 57–61*).—The author has worked out a series of factors relating conductance to total concentration of dissolved electrolytes. The values of these factors fluctuate chiefly with changes in total electrolyte content and with the percentages of sodium and of chloride as of total cations and anions, respectively. "Having determined the conductance of a water and its sodium and chloride content, one can, by means of the factors presented, calculate with considerable accuracy the total electrolyte content of a water and the sum of calcium plus magnesium expressed as milliequivalents. The method here described is in no sense offered as a substitute for complete analysis but rather as a

means of detecting errors made either in the course of such analyses or in calculating and recording the results. In those cases where a rough estimate of calcium plus magnesium is all that is needed, the method is satisfactory, provided important amounts of bases other than calcium, magnesium, and sodium are absent."

A simple apparatus and procedure for the determination of the carbon content of the soil, B. E. Christensen, G. Simkins, and V. Hiatt. (Oreg. State Col.). (*Soil Sci., 49 (1940), No. 1, pp. 51–56, fig. 1*).—The authors describe a set-up (of which a diagrammatic drawing is included) consisting essentially of a reaction flask in which a soil sample (250 mg.) is oxidized by 250 mg. either of potassium dichromate or potassium iodate and sulfuric acid, a slow combustion unit (as used in gas analysis) containing a platinum wire spiral to be heated to redness by a suitable current, and an absorption flask in which the carbon dioxide, after transfer from the slow combustion unit, is taken up in 10 cc. of 0.25 N barium hydroxide solution. The excess barium hydroxide is titrated with 0.05 N hydrochloric acid, after addition of 5 cc. of acetone to improve the clarity of the end point, with thymol blue as indicator. This apparatus reduces the requirements of time and operative skill and eliminates errors due to formation of carbon monoxide or to the presence of halides.

The determination of ammonia and amide nitrogen in connection with the chlorate method for nitrogen in plant tissues, E. M. Emmert. (Univ. Ky.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 89, 90*).—This is a preliminary account.

The sulphuric acid oil digestion method for avocados, H. P. Traub, C. H. Russell, C. T. O'Rork, Jr., J. M. Tubbs, and R. E. Caldwell. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 429–431*).—Herein is outlined in preliminary form a method for oil determination in the avocado.

Some observations on the determination of soap in refined oil, H. A. Schuette and C. H. Hine. (Univ. Wis.). (*Oil & Soap, 16 (1939), No. 1, pp. 13, 14*).—Recovery experiments made by two quite different procedures indicate that the most satisfactory approach to a solution of the problem of determining the soap content of a refined oil probably rests upon the assumption that the chloride which is formed upon the addition of hydrochloric acid is an index of the quantity present.

Colorimetric evaluation of derris and cube roots, H. A. Jones. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed., 11 (1939), No. 8, pp. 429–431*).—By colorimetric procedures combined with the usual method for determining rotenone it is possible to estimate the insecticidal value (with respect to houseflies) of roots of derris and cube. Another color reaction may be used to obtain a rough estimate of the total content of substances of the rotenone type.

The determination of coenzyme I in animal tissues, A. E. Axelrod and C. A. Elvehjem. (Wis. Expt. Sta.). (*Jour. Biol. Chem., 131 (1939), No. 1, pp. 77–84, fig. 1*).—This paper contains a detailed description of the yeast fermentation method for the determination of coenzyme I as developed by von Euler and by Myrbäck, with tabulated data on the coenzyme I content of liver, kidney cortex, brain gray matter, gastrocnemius muscle, and blood of the guinea pig, rat, and chicken; of all of the above tissues except brain gray matter for the dog; and of human blood.

The method is based upon the principle that the addition of varying amounts of coenzyme I to a washed yeast preparation produces rates of fermentation proportional, within certain limits, to the quantity of coenzyme I added. The constituents of the fermentation set up include apozymase (a washed yeast preparation containing all of the enzymes necessary for the yeast fermentation

except coenzyme I), a sodium and potassium phosphate buffer solution, and solutions of glucose, magnesium and manganese chlorides, hexosediphosphate, and the coenzyme I or tissue extract to be tested for coenzyme I. Directions are given for preparing these solutions, but it is noted that the optimum levels for each constituent must be determined for each type of yeast employed.

The range of values reported for the blood of various species, with the number of subjects for each test, is as follows: Guinea pigs 65–89 μg. per gram of fresh weight (4 subjects), rat 84–106 (6), chicken 65–105 (15), dog 51–66 (4), and human 20–35 μg. per gram (10 subjects).

A new application of kinetic colorimetry in the study and the determination of vitamins and provitamins D [trans. title], Y. RAOUL and P. MEUNIER (*Compt. Rend. Acad. Sci. [Paris], 209 (1939), No. 14, pp. 546–548, fig. 1*).—A reagent consisting of antimony trichloride with a small amount of acetic anhydride was applied to calciferol, ergosterol, lumisterol, and cholesterol, and the rates of the several reactions observed. The maximum intensity of reaction, as observed by the absorption measured in the region of 400–450 mμ, was attained in 45–60 sec. with the calciferol, in 7–8 min. with ergosterol and lumisterol, and in a still longer time with cholesterol. Conclusions from these results could not be applied to mixtures, however. A modified reagent consisting of 30 cc. of a saturated chloroform solution of antimony trichloride, 3 cc. of acetic anhydride, and 5 drops of concentrated sulfuric acid was applied at the rate of 3.5 cc. to 0.5 cc. of a chloroform solution (containing 50γ of the sterol) of the several products under investigation. After agitation, the absorption luminescence, measured with the use of the blue filter, was determined every 30 sec. for 4 or 5 min. With a sterol having a double bond (cholesterol), the reaction developed slowly; with compounds having two conjugated double bonds in ring B, such as lumisterol, ergosterol (provitamin D_2), and 7-dehydrocholesterol (provitamin D_3), the reaction attained maximum intensity at once, maintaining it at a constant value. With compounds containing three conjugated double bonds, as in the vitamins D_2 and D_3, the coloration, very intense at the beginning, diminished rapidly to a fixed minimum. It is considered that these reaction rates are a valuable indication of the number of double bonds in the B ring of the sterol.

Determination of vitamin A and carotene in organs, L. SKURNIK and P. SUHONEN (*Ztschr. Vitaminforsch., 8 (1938–39), No. 4, pp. 316–323; Ger., Fr. abs., p. 323*).—Results obtained by a method developed by the authors are compared with results by three other methods, namely, those of Moore (E. S. R., 64, p. 393), of Brockmann and Tecklenburg, and of Wolff (E. S. R., 80, p. 728). The methods differ primarily in the details of hydrolysis and extraction, vitamin A in the final extract being determined in each case by the Carr-Price method with the use of the Pulfrich step photometer (filter S 61) for measurement of the color intensity. The present method gave values in good agreement with those obtained with the Wolff procedure. They were much higher, however, than those obtained by the other two methods. It was shown in the case of the Moore method that extraction of the vitamin was incomplete and that by the method of Brockmann and Tecklenburg losses of some sort occurred in the later stages of extraction and saponification.

The procedure established after preliminary trials to determine the effect of variations in saponification time and KOH concentration involves hydrolysis in an atmosphere of nitrogen or carbon dioxide of 1 gm. of tissue (liver) by 2 cc. of 20 percent KOH, the mixture being held on a water bath for 45 min. The cooled extract, treated with 2 cc. of 96 percent ethyl alcohol, is extracted repeatedly with 2-cc. portions of petroleum ether (b. p. 30°–50° C.), the extract being removed carefully each time after shaking and centrifugation of the

mixture. The combined extracts are evaporated in an atmosphere of nitrogen or carbon dioxide, the vitamin A being then taken up in chloroform for determination by the Carr-Price method.

An increase in the vitamin A values of liver was noted with storage of the tissue in air but not with storage in nitrogen. The specificity of the Carr-Price reaction for vitamin A was shown to be high.

The biological determination of crystalline vitamin B_1, K. H. COWARD and B. G. E. MORGAN (*Biochem. Jour., 33 (1939), No. 5, pp. 658–662*).—Data are reported on four series of experiments in which the response of pigeons to graded doses of crystalline vitamin B_1 was measured by the percentage of birds cured and the average duration of the cure. The findings confirm and augment the earlier conclusions of Kinnersley and Peters (E. S. R., 77, p. 279) that a relation between the size of the dose of crystalline vitamin B_1 and its effect on pigeons becomes apparent only in terms of the percentage of birds cured. On statistical analysis of the results, it was found that the accuracy of the method was no greater than had been reported in an earlier study in which the international standard clay adsorbate had been used (E. S. R., 72, p. 566). It was concluded that the pigeon test, even using the percentage of birds cured, remains the least accurate of the various methods of vitamin B_1 assay.

The structure of vitamin B_6, I, II (*Jour. Amer. Chem. Soc., 61 (1939), No. 5, pp. 1237–1242, figs. 4; pp. 1242–1244*).—Earlier work (E. S. R., 79, p. 441) involving isolation and characterization of vitamin B_6 was continued.

The first paper, by E. T. Stiller, J. C. Keresztesy, and J. R. Stevens, presents evidence leading to the establishment of the structure of the vitamin, using the purified vitamin isolated from rice bran. The results of qualitative tests, the nature of the absorption spectra, the conversion reactions applied, and the results obtained are considered in detail, and the findings are interpreted. In particular, the methyl ether of vitamin B_6 was oxidized to give a lactone $C_9H_9O_3N$ and a dibasic acid $C_9H_9O_5N$. The acid was shown to be 2-methyl-3-methoxypyridine-4,5-dicarboxylic acid. Vitamin B_6 was shown to be 2-methyl-3-hydroxy-4,5-di-(hydroxymethyl)-pyridine.

The second paper, by S. A. HARRIS, E. T. STILLER, and K. FOLKERS, deals with the syntheses of the dibasic acid $C_9H_9O_5N$ and the lactone $C_9H_9O_3N$ noted above. 3-Cyano-4-ethoxymethyl-6-methyl-2-pyridone was made from ethoxyacetylacetone and cyanacetamide. This 2-pyridone derivative was converted by a series of reactions noted in detail to the lactone of 2-methyl-3-methoxy-4-hydroxymethyl-5-carboxypyridine. This was readily oxidized by barium permanganate to give 2-methyl-3-methoxy-4,5-pyridinedicarboxylic acid. This lactone and the acid, both derived synthetically, were found to be identical with the lactone and the acid obtained by the oxidation of the methyl ether of vitamin B_6. The structure of vitamin B_6 is thus proved to be 2-methyl-3-hydroxy-4,5-di-(hydroxymethyl)-pyridine.

Synthesis of vitamin B_6, [I], II, S. A. HARRIS and K. FOLKERS (*Jour. Amer. Chem. Soc., 61 (1939), Nos. 5, pp. 1245–1247; 12, pp. 3307–3310*).—Following the elucidation of the structure of vitamin B_6, noted above, complete synthesis, starting with ethoxyacetylacetone and cyanacetamide, was accomplished. The first paper of the present series describes the details and gives graphic representations of the reactions used for the synthesis of this vitamin. Biological assay of the synthetic product gave results parallel to those previously reported for the natural vitamin (E. S. R., 79, p. 441), a single dose of 100γ effecting a complete cure within 14 days when fed to vitamin B_6-deficient rats.

In the second paper variations and improvements in the above-noted synthesis of vitamin B_6 are presented, and new derivatives of some of the intermediate compounds are indicated. A new inner ether of vitamin B_6 is also described

Important variations in the synthesis involve direct hydrolysis of the compounds 2-methyl-3-hydroxy-4-ethoxymethyl-5-hydroxymethylpyridine and 2-methyl-3-amino-4-ethoxymethyl-5-aminomethylpyridine. Hydrolysis effected by heating with dilute HCl at 150°-175° [C.] under pressure converts these compounds to the corresponding hydroxy derivatives.

Determination of ascorbic acid: Electrometric titration method, M. M. Kirk and D. K. Tressler. (N. Y. State Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 11 (1939), No. 6, pp. 322, 323, fig. 1).—The method described involves the use of an electrometric titrimeter with the quantitative unit. Readings are taken at regular intervals during the process of oxidation of the ascorbic acid in the dye titration, and the curve is plotted of quantities of the dye used against the dial readings on the titrimeter. The first large change of potential is taken as the end point of the reaction. The technic of preparing the plant extracts to be tested and conducting the titration is described, and comparative values are reported for the ascorbic acid content of a number of vegetables and fruits by visual and electrometric titration. The differences range from −5.9 to +7.0 percent. Corresponding values by iodine titration are included for several varieties of yellow tomato, the differences from visual titration ranging from −4.7 to +45.3 percent.

The amount of ascorbic acid in the tissues as determined by the dichlorophenol and methylene blue methods [trans. title], A. Giroud, E. Gero, M. Rabinowicz, and E. Hartmann (*Bul. Soc. Chim. Biol.*, 21 (1939), No. 7-8, pp. 1021-1032, figs. 6).—Simultaneous determinations by the dichlorophenol and methylene blue methods of the content of ascorbic acid in various tissues of the ox and guinea pig are reported, with results confirming earlier conclusions of specific distribution of ascorbic acid in different tissues of the organism of various species (E. S. R., 81, p. 147). The dichlorophenol values were consistently somewhat higher than the methylene blue values, with the differences more marked in certain organs than others. The question as to whether the differences are due to reducing substances other than ascorbic acid or to the presence of other forms of ascorbic acid which are not affected by methylene blue was tested by comparisons of the values obtained by the two methods in tissues and organs of guinea pigs deprived of vitamin C for 24 days and normal guinea pigs receiving 40 or 100 mg. of ascorbic acid. The differences between the values obtained by the two methods increased with the quantity of vitamin C absorbed, thus indicating that the differences represent some form of ascorbic acid rather than nonspecific reducing substances. In the animals depleted of vitamin C the differences in the two readings were greatest in the hypophysis, followed by the liver and the adrenals. Positive values were obtained with all of the tissues by the dichlorophenol method but negative values or traces only in some of the organs and tissues by the methylene blue method. The differences are thought to be attributable to dehydroascorbic acid, which does not react with methylene blue.

Resistance of ascorbic acid (vitamin C) to the action of heat [trans. title], J. Pien and H. Meinrath (*Compt. Rend. Acad. Sci [Paris]*, 209 (1939), No. 11, pp. 462-464).—One percent solutions of ascorbic acid in doubly distilled water containing 6.4 percent of trichloroacetic acid were buffered with mixtures of monopotassium and disodium phosphates to pH values of 3.2, 5, 7, and 8 and with the unbuffered solution (pH 0.64) were heated in U tubes in an autoclave to 120° [C.] for 5, 10, 15, 20, and 30 min. in atmospheres of oxygen, air, nitrogen, and CO_2, with determinations by the Tillmans titration method of the content of ascorbic acid before and after the heat treatment. In oxygen the percentages of ascorbic acid recovered ranged from 2 percent for the solution of pH 8 heated for 20 min. to 32 percent for the solution at pH 3.2

heated for 5 min. In air the corresponding percentages recovered ranged from 46 percent for the solutions at pH 7 and 8 heated for 30 min. to 72 percent for the solution at pH 3.2 heated for 5 min. Identical results were obtained for the solutions heated in nitrogen and carbon dioxide, the recoveries ranging from 86 percent for the solution at pH 8 heated for 30 min. to 96.5 percent for the unbuffered solution heated for 10 min. All but two of the solutions heated in the inert atmosphere retained over 92 percent of their original ascorbic acid content.

AGRICULTURAL METEOROLOGY

Textbook of meteorology, edited by R. Süring (*Lehrbuch der Meteorologie. Leipzig: Willibald Keller, 1938, 5. ed., rev., pt. 4, pp. 289–384, pls. 2, figs. 28; 1939, 5. ed., rev., pt. 5, pp. VII+[1]+385–480, pls. 9*).—Parts 4 and 5 of the fully revised edition of the work previously noted (E. S. R., 80, p. 447).

Bibliography of meteorological literature (*Roy. Met. Soc. [London], Bibliog. Met. Lit., 4 (1938), No. 6, pp. [2]+295–351*).—This number presents references to the meteorological literature received from July to December 1938.

Monthly Weather Review [September-October 1939] (*U. S. Mo. Weather Rev., 67 (1939), Nos. 9, pp. 321–364, pls. 14, figs. 34; 10, pp. 365–413, pls. 18, figs. 7*).—In addition to the usual detailed summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, and bibliographical and other information, these numbers contain articles noted below and on page 732 and the following contributions:

No. 9.—On the Origin and Distribution of Thunderstorm Electricity, by W. J. Humphreys (p. 321); Methods and Results of Ozone Measurements Over Mount Evans, Colo., by R. Stair and I. F. Hand (pp. 331–338); and Tropical Disturbance of September 24–26, 1939, in the Gulf of Mexico, by W. E. Hurd (p. 340).

No. 10.—Hail and Windstorm Over Southeastern Louisiana, February 26, 1939, by G. L. Canaday (pp. 365, 366); The MacGregor Arctic Expedition to Etah, Greenland, July 1, 1937, to October 4, 1938, by C. J. MacGregor (pp. 366–382); and Tropical Disturbances of October 1939, by W. E. Hurd (pp. 382, 383).

On weather changes from day to day, H. Arctowski (*U. S. Mo. Weather Rev., 67 (1939), No. 9, pp. 322–330, figs. 24*).—The author discusses the relations between weather changes and waves of pressure registered by the barograph. Connected areas of increase and decrease of pressure on the map show the extent of a wave. The author proposes the names "anoterons" to the areas of positive pressure differences observed from day to day at a given hour and "katoterons" to those of pressure decrease. The pressure wave may therefore be called a "teron" or a "baroteron," and the barograms are said to show that "brachyterons" or waves of short duration should often be taken into consideration. North American baroterons and thermoterons, Russian data, pressure changes in Turkistan, India, China, and Australia, and rainfall and baroterons are taken up in detail, with illustrating maps.

The interaction of weather and forest [trans. title], R. Geiger (*Forstarchiv, 15 (1939), No. 9, pp. 195–200*).—A general discussion of the relationships of forest distribution and growth with weather and climate.

Silviculture and forest meteorology, M. Woelfle (*Waldbau und Forstmeteorologie. Neudamm: J. Neumann, 1939, pp. 75, figs. 15*).—This monograph takes up the economic results of investigations from the Forest Meteorological Institute at Munich (1924–38), discussing the historical development and present status of forest meteorology and its significance to silviculture; frost and temperature distribution in the forest; average daily amounts of light and

the sunshine relations at the borders of stands; determination of atmospheric water vapor in the forest; wind relations in the stand, wind protection by forests and hedges, storm injuries in the forest, and economic measures relating to wind on the basis of the author's studies; and evaporation phenomena.

Do climatological averages serve adequately as normals? G. W. MINDLING. (U. S. D. A.). (*Bul. Amer. Met. Soc., 21 (1940), No. 1, pp. 3–6, figs. 2*).—This is an abstract of an address in which average and medium values are compared for expressing such climatic factors as rainfall, snowfall, and temperature.

Variation in solar radiation intensities at the surface of the earth in the United States, I. F. HAND (*U. S. Mo. Weather Rev., 67 (1939), No. 9, pp. 338–340, fig. 1*).—This article brings to date two papers by Kimball previously noted (*E. S. R., 40, p. 117; 52, p. 715*), though here the data are given from stations in the United States only, whereas the previous ones included all available data for the entire world. The relationships of the three major and several minor volcanic eruptions, as well as local influences such as duststorms, forest fires, irregular manufacturing activity, etc., are noted as important factors in the fluctuations observed and indicated in the curves presented.

Atmospheric turbulence, H. LETTAU (*Atmosphärische Turbulenz. Leipzig: Akad. Verlagsgesell., 1939, pp. XI+283, figs. 59*).—This is a monograph on the various phases of the subject of air movement in their historical, scientific, and practical aspects. An index and 246 references are included.

The installation and maintenance of rainfall and temperature instruments, H. W. BRODIE (*Hawaii. Sugar Technol. Rpts., 2 (1939), pp. 39, 40*).—The author calls attention to sources from which errors may arise in the use of some of the more common instruments, and more particularly in the use and maintenance of two of the most important weather instruments from the standpoint of sugarcane plantation interest, viz, the rain gage and thermometer.

The weekly period in Washington precipitation, C. G. ABBOT and N. M. MCCANDLISH (*Smithsn. Misc. Collect., 98 (1939), No. 21, pp. [1]+4*).—From a study of the records (1924-39) it is concluded that, "assuming a periodicity of 6 days 18 hr. in precipitation at Washington [D. C.], a day of maximum precipitation persists in the averages for many months, on which day from 2 to 8 times as much precipitation falls as on neighboring days of minimum precipitation usually 1 day earlier and 2 days later. At intervals ranging from 40 to 100 weeks the day of maximum precipitation shifts a little within the period, and at times, though rarely, a pronounced double maximum persists."

Vegetation and the water cycle [trans. title], W. WUNDT (*Kulturtechniker, 42 (1939), No. 7–8, pp. 195–207*).—This is a general discussion and analytical review (24 references) of the relationships of the plant cover to weather conditions, with special reference to the water requirements of crop plants.

Fifty inches of rain: A story of land and water conservation (*[Knoxville]: Tenn. Val. Authority [U. S.], [1939], pp. III+[1]+111, [figs. 14]*).—"The unified plan for the development of the Tennessee River drainage area evolves basically from the control of water and the problems resulting from years during which such control has been lacking. . . . One in. of rainfall on just 1 acre of land weighs 113 tons. In the Tennessee Valley area in a year nearly 6,000 tons of water fall on every acre. When, as a result of unwise use of land by the destruction of its crop and forest covers, this water runs off over the land instead of through it, there follow 'the floods you do not see.' . . . They are evident in the abandoned farms, the gullied slopes, the disintegrating homesteads, and the degrading poverty which are spreading themselves across a countryside that is potentially a land of plenty. . . . Report is made of the work done by the Tennessee Valley Authority in controlling the

waters in the river channels, on the land, and in putting the power of the river to work."

Hydrologic studies: Compilation of rainfall and run-off from the watersheds of the North Appalachian Conservation Experiment Station, Zanesville, Ohio, 1933–38, H. L. BORST and R. WOODBURN (*U. S. Dept. Agr., Soil Conserv. Serv., 1939, SCS–TP–26, pp. [3]+25+[136], figs. 115*).—The tract under study consists of ±250 acres ranging from ±880 to 1,040 ft. above sea level. The soil is chiefly Muskingum silt loam, with associated Wellston and Elfort silt loams. The effects of land use on run-off and erosion were studied on a pasture watershed of 3.57 acres, a cultivated watershed of 2.55 acres, and a wooded watershed of 2.23 acres. All storms are tabulated, and ±10–12 important run-off-producing storms each year are analyzed in detail. Pertinent facts concerning the instruments employed (rain gages, Parshall flumes, and Ramser silt samplers) are tabulated, and methods used in compiling rainfall and surface run-off data are briefly discussed. Appendix A, by N. L. Eriksson, consists of a description of the wooded watershed, appendix B is made up of maps, and the recorded data, constituting the bulk of the report, are given in appendix C.

Major Texas floods of 1935, T. DALRYMPLE ET AL. (*U. S. Geol. Survey, Water-Supply Paper 796–G (1939), pp. V+223–284, pls. 9, figs. 10*).—A very heavy rainstorm early in the morning of May 31 over the Seco Creek Basin reached a maximum of from 22 to 24 in. in 3.5 hr. The resulting flood in Seco Creek exceeded any previously known. A slope-area measurement of discharge made in a reach about 11 miles above D'Hanis gave a peak discharge of 230,000 sec.-ft. from a drainage area of 153 sq. miles, or 1,500 sec.-ft. per square mile.

Heavy rains, amounting to probably 20 in. at some places, fell over the Colorado and Nueces drainage basins the first 2 weeks in June, causing floods greater than ever had been recorded in these basins. The maximum discharge of the West Nueces River at a reach about 28 miles north of Brackettville was 580,000 sec.-ft. from a drainage area of 402 sq. miles, equivalent to 1,440 sec.-ft. per square mile. So far as known this is the highest discharge ever recorded from an area of like size. The greatest recorded discharge on the Nueces River was near Uvalde, below the mouth of the West Nueces, where the peak discharge was determined as 616,000 sec.-ft. The drainage area is 1,930 sq. miles. The peak stage of 36.9 ft. exceeded by 10.5 ft. the previous maximum known stage (June 1913).

Epochal flood frequency and intensity in the river district of La Crosse, Wisconsin, A. D. SANIAL and N. A. MATSON. (U. S. D. A.). (*Bul. Amer. Met. Soc., 21 (1940), No. 1, pp. 12–17, figs. 2*).—The general conclusions from this study of weather records and historical data over a long period of years are that there is a very definite trend toward earlier spring floods, a change believed due to deforestation and increased cultivation of the land; that the trend in flood frequency is toward fewer and less intense floods; that the greater number occur in the spring; and that the trend is toward fewer fall floods during the later period of study. The shortcomings of the study and the apparent results of canalization are also briefly discussed.

Report of Committee on Snow, 1938–1939, J. E. CHURCH ET AL. (Nev. Expt. Sta.). (*Amer. Geophys. Union Trans., 20 (1939), pt. 4, pp. 489–506; 617–635*).—This includes, among other things, discussions of the snow cover; regional and project reports; snow sports, transport, and avalanches; equipment; polar activities for 1938 (L. M. Gould); snow survey conferences; research; summaries of leading publications; rainfall and tree growth in the Great Basin,

1938 (review by G. V. Sager); and list of current publications to accompany the report of the committee (pp. 617–635).

Vegetative and reproductive recovery of avocado trees from the January 1937 freeze, F. F. Halma and A. Courtney. (Univ. Calif. et al.). (*Calif. Avocado Assoc. Yearbook, 1939, pp. 54–67, figs. 12*).

[Storm damage to trees] (*East. Shade Tree Conf., New York, 1939, Proc., pp. 3–5, 12–46, 68–75, 86–88, pls. 7, fig. 1*).—The following papers are included: The Storm in Newark, N. J., of Wednesday, September 21st, by C. Bannwart; The Hurricane in Rhode Island and Its Lessons for a Future Shade Tree Policy, by A. E. Stene; Cemetery Trees, With Illustrations of Storm Damage, by O. F. Burbank; Storm Damage in Vermont and the Forest Tent Caterpillar, by H. L. Bailey; Dealing With Storm Damage in Central Massachusetts, by M. A. McKenzie (Mass. Expt. Sta.); Wood Rots as Factors Before and After the Hurricane, by P. Spaulding, and Combating Infection of Storm-Damaged Trees, by R. P. Marshall (both U. S. D. A.); The Relation of Insect Work to Hurricane Damage, by S. W. Bromley; The Broader Aspects of Hurricane Damage, by E. P. Felt; and Hurricane Damage in Hartford and Better Trees for Street and Ornamental Planting, by G. H. Hollister.

The internal temperatures of cotton bolls, D. B. Anderson. (N. C. Expt. Sta. and U. S. D. A.). (*Amer. Jour. Bot., 27 (1940), No. 1, pp. 43–51, figs. 6*).—The temperature at the center of full-sized immature bolls exposed to full sunlight was always above that of the surrounding air, differences of 6°–8° C. usually being noted under direct radiation. Every cloud across the sun caused a rapid temperature fall, which was often greater at the center of the boll than in the air. The high and low points of the temperature curves at the center and in the air occurred at nearly the same time. In the shade bolls had internal day temperatures close to those of the air, but they were less responsive to air temperature changes than bolls exposed to the sky. At night bolls exposed to clear sky usually had internal temperatures somewhat below (less than 1°) those of the air, but when shaded by leaves or cotton cloth they usually had internal temperatures slightly above (also usually less than 1°) those of the air. The temperature at the center of a boll exposed to a clear sky at night rose above that of the air soon after radiation to the sky was prevented by a cotton cloth screen, but when the screen was removed the temperature again dropped below that of the air. Temperature changes at the center of the boll were apparent within a few minutes after placing or removing the screen. The temperature beneath the carpel wall of a boll exposed to a clear sky was higher than that at the center during the incidence of sunlight and colder than the center at night. The temperatures at the center of shaded bolls were usually higher than those just beneath the carpel wall during both day and night. Respiration is apparently not important in affecting the internal temperature of full-sized immature bolls.

A further study of interglacial peat from Washington, H. P. Hansen and J. H. Mackin. (Oreg. State Col. et al.). (*Bul. Torrey Bot. Club, 67 (1940), No. 2, pp. 131–142, figs. 2*).—In a previous paper[1] H. P. Hansen interpreted the forest succession during a brief interval of interglacial time from pollen analysis of a peat stratum near Auburn, Wash. The peat of this study is located in the south central part of Seattle. Pollen analysis here tended to corroborate the geological evidence, since the initial forests of interglacial time consisted of species similar to those in the same area as well as in other regions in the Pacific Northwest during early post-Vashon time. In terms of climate, the forest succession suggests four poorly defined alternating periods of coolness and

[1] Wyo. Univ. Pubs., 5 (1938), No. 2, pp. 11–18, fig. 1.

dryness and warmth and humidity, beginning with the former. The value of pollen statistics is discussed.

Climatological data for the United States by sections, [1938] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 25 (1938), No. 13, pp. [270], pls. 2, figs. 28*).—Summaries are given of climatological data for each month of 1938 and for the year as a whole for each State.

SOILS—FERTILIZERS

[Soil investigations of the Bureau of Plant Industry] (*U. S. Dept. Agr., Bur. Plant Indus. Rpt., 1939, pp. 24–27, 28, 37*).—Work on selenium in soils, minor elements in soils and vegetation, characteristics of various soil groups, and developments in soil physics; pecan soil-fertility maintenance, relation of soil-fertility factors to cotton root rot, green-manure studies in the South, fertilizer placement, phosphate availability, and salt-water flooding of farm land; nonfixation of nitrogen by honeylocust and need of plants for certain minimum concentrations of boron, and removal of salt concentration by copious irrigation is briefly noted.

[Soil investigations by the Georgia Station] (*Georgia Sta. Rpt. 1939, pp. 27, 29, 30, 31–33, figs 4*).—The following are noted: Reliability of rapid chemical tests and the accumulation of available phosphorus and potash in soils receiving various amounts of fertilizer mixtures.

[Soil investigations by the Iowa Station]. (Partly coop. U. S. D. A.). (*Iowa Sta. Rpt. 1939, pt. 1, pp. 69–78, 119–124, figs. 2*).—Effects of fertilizing materials and methods of grazing on soil conditions and plant growth on permanent pastures, and relative value of red clover, alfalfa, and sweetclover as soil-building crops are reported by W. H. Pierre; decomposition of lignin in soils, by A. G. Norman; decomposition of some humus-forming materials in soils, by Norman and R. W. Pearson; relation between the capillary tension and the moisture content of soil as determined by porous ceramic cells, by L. A. Richards; factors determining the flow and distribution of water in soils and the development of field apparatus for soil moisture measurement, by Richards; microscopic studies on soil erosion, by J. B. Peterson; microbial thermogenesis, and microbiological status of some Iowa soils as affected by waterlogging and erosion, both by Norman and Richards; microbiological aspects of the decomposition of plant materials, by Norman; forms of phosphorus in soils and their availability to plants, by Pearson and Pierre; and the establishment and maintenance of hill culture plantations, by J. M. Aikman.

Soil management experiments (*Kentucky Sta. Bul. 397 (1939), pp. 317–389, fig. 1*).—The general plan of the experiments, method of computing crop increases, fertilizing materials used, method of reporting crop yields, crop and fertilizer values, discontinued experiments, experiments in progress, the Lexington soil experiment field, and manuring experiments at Lexington are reported upon by G. Roberts, J. F. Freeman, and E. J. Kinney; experiments at the Western Kentucky Substation, by S. J. Lowry and L. Caldwell; the Berea soil experiment field, by H. H. Harrison; the Fariston soil experiment field, by N. M. Byble; the Campbellsville soil experiment field, by A. McKinley; the Greenville soil experiment field, by C. R. Lovell; and the Mayfield soil experiment field, by J. L. Payne. Recommendations on soil management and fertilizer practices conclude the bulletin.

[Soil investigations by the Maryland Station] (*Maryland Sta. Rpt. 1939, pp. 26, 27, 28, 29, 30*).—These have included work on the effect of organic matter on the fertility of Leonardtown loam, field studies of the fertility requirements and management of important soil types, efficiency of soil-fertility management,

the study of methods of obtaining total exchange capacity and exchangeable base content of soils, and rapid soil testing.

[Soil investigations by the Cornell Station] (*[New York] Cornell Sta. Rpt. 1939, pp. 102–104, 159*).—This report notes work on bacterial flora of drainage from peat soil, by B. D. and J. K. Wilson; capillary conductivity of water in peat soils, and fixation of phosphorus in peats of varying composition, both by B. D. Wilson and E. V. Staker; unproductive peat in relation to prolonged cultivation, by B. D. Wilson, Staker, and A. G. Newhall; the use of commercial nitrogen to supplement farm manure, by J. A. Bizzell; and the protein content of alfalfa cut at several stages of growth, by Bizzell and E. W. Leland; and the response of apples to nitrogen on leguminous and nonleguminous sod, by A. J. Heinicke.

The relation between soil reaction, erosion, and aggregation of silt and clay in Clarksville loam, H. T. Rogers. (Va. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 11, pp. 915–923, figs. 4*).—A close correlation between erodibility and soil reaction was observed in a series of plats of Clarksville loam ranging in pH from 4.45 to 7.41, while a highly significant negative correlation was found to exist between degree of aggregation and H-ion concentration. The addition of ground limestone to Clarksville loam up to the quantity required to produce a neutral reaction definitely improved the physical condition of the soil and its resistance to erosion.

Increasing quantities of soluble aluminum were accompanied by decreasing quantities of silt and clay aggregated into units larger than silt size. No significant relationship between total organic matter and degree of aggregation or observed erodibility was shown to exist.

The oxidation-reduction potential of alkaline calcareous soils in relation to puddling and organic matter decomposition, T. F. Buehrer, W. P. Martin, and R. Q. Parks. (Ariz. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 11, pp. 903–914, figs. 6*).—It was found that the Eh-pH relationship in arid alkaline soils could be more satisfactorily studied by making use of the pH change due to simple dilution with water than by adding acid or alkaline solutions. The slope of the line for such soils is found to be —0.068, which approximates closely to the theoretical value for the organic systems commonly present during carbohydrate decomposition.

Puddling caused a marked decrease in the redox potential, particularly when the soil had been treated with alfalfa. Factors other than oxygen depletion are believed responsible for this decrease. A sharp initial drop in the potential occurred in both puddled and unpuddled soils that had been treated with alfalfa. This may be attributed principally to the nature of the reduced compounds formed during the decomposition. Measurements of redox potential made in an atmosphere of nitrogen and oxygen, respectively, are considered to have given evidence of the existence of an oxygen potential, inasmuch as the redox potential dropped sharply when nitrogen was bubbled through and increased in the presence of oxygen.

A soil moisture tensiometer with a compact manometer, L. A. Richards and R. W. Pearson. (Iowa Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 11, pp. 986–989, fig. 1*).—A scale drawing shows the construction of a manometer involving no difficult glass blowing and indicates its connection to a small porous cup, the apparatus being designed especially for the control of soil moisture content in 1-gal. crocks. A group of experiments in which corn, thinned to four plants per pot, was grown at water tensions of 50 cm. of mercury, from 30 to 50, and from 0 to 30 cm. is reported. Three pots each were grown in the dry, the intermediate, and the wet series. The uniformity of the results indicated very satisfactory control of moisture conditions.

[Soil Survey Reports, 1932 and 1934 Series] (*U. S. Dept. Agr., [Soil Survey Rpts.], Ser. 1932, No. 38, pp. 35, pl. 1, figs. 2, map 1; 1934, Nos. 15, pp. 47, figs. 3, map 1; 16, pp. 66, pls. 2, figs. 2, map 1*).—These surveys were made in cooperation with the respective State experiment stations: 1932, No. 38, the lower Yellowstone Valley area, Mont., W. DeYoung et al.; and 1934, Nos. 15, Cheboygan County, Mich., Z. C. Foster et al., and 16, Bonner County, Idaho, E. N. Poulson et al.

The genesis of Davidson clay loam, F. Hardy and G. Rodrigues (*Soil Sci., 48 (1939), No. 6, pp. 483–495*).—The formation of a yellow weathering crust from the parent rock and of the B horizon red earth from the crust was studied, and the red earth part of the Davidson soil was compared, in some respects, with those of the British Guiana and Grenada soils.

The crust was found to be a sandy material consisting essentially of chlorite, secondary quartz, and halloysite, together with gibbsite, which indicates its lateritic nature. Its colloidal fraction (less than 10 percent of the whole) contains an unidentified iron-bearing clay mineral of probable formula $2Fe_2O_3 \cdot SiO_2 \cdot 2H_2O$. Its composition is contrasted with that of the Laterite crust of decomposing basic igneous rocks occurring in British Guiana and Grenada which contains three times as much gibbsite and halloysite but no chlorite and much less quartz.

The B horizon red earth of the Davidson profile and of the British Guiana and Grenada profiles was found to contain more than half its weight of colloidal matter; to consist essentially of halloysite, stained red with free hydrous iron oxides, probably mainly goethite, together with some anhydrous hematite; and to contain an appreciable amount of gibbsite and a little secondary quartz. The Davidson red earth was also shown to contain free hydrous silica.

The genesis of the halloysitic component of red earths is believed to consist in the resilication of gibbsite occurring in the weathering crusts, and chiefly derived from basic (lime-soda) feldspars occurring in the parent igneous rock.

"The Davidson soil profile displays a partially podzolized A horizon, with slight accumulation of iron oxide in the B_2 horizon. Humid tropical red earth profiles usually display similar but much more pronounced differentiation. Their A horizon in some instances consists almost entirely of residual quartz sand."

Consistency and physicochemical data of a loess pampaneo soil.—I, Physicochemical properties of samples from different depths of a profile, H. F. Winterkorn and G. W. Eckert. (Mo. Expt. Sta.). (*Soil Sci., 49 (1940), No. 1, pp. 73–82, figs. 5*).—From data on the mechanical composition, consistency properties, heat of wetting, and sorption of liquids obtained with samples taken from different depths of a profile of loess pampaneo soil, the authors conclude that a large clay content and a large plastic index indicate rather the potential water-holding capacity of a soil than the behavior of the natural soil toward the action of water in situ. The actual behavior of a relatively dry soil system toward water can be represented as a dynamic equilibrium between the wetting energy of the water and the cohesive forces acting in the soil system. The mechanism of the water attack is a function of the accessibility of the internal surface of the soil. The amount and type of the organic material in a soil exerts a considerable influence on the behavior of the soil toward water. In this connection, the change of the C : N ratio of the organic material with change in depth of the profile is probably of importance.

From a practical standpoint, soil from the surface 8 in. should make a better subgrade for roads than the subsoil. It should also give better results

bituminous stabilization, as indicated by its preferential wetting with benzene.

Dispersion of lateritic soils and the effect of organic matter on mechanical analysis, O. W. BEALE. (U. S. D. A. and S. C. Expt. Sta.). (*Soil Sci., 48 (1939), No. 6, pp. 475–481, pl. 1*).—Flocculation occurred during mechanical analysis of some lateritic soils dispersed with sodium oxalate, with the result that the values obtained for the clay fractions were far too low. Stable suspensions were obtained by using a mixture of 5 cc. 0.5 N $Na_2C_2O_4$ and 3 cc. N NaOH. Data from 32 samples of lateritic soils show that the clay contents are slightly higher when the organic matter is removed, the silt fractions are not significantly different, and the sand fractions of the untreated samples are higher. It is concluded, in view of the time and work saved and the small difference between the two methods, that the hydrogen peroxide pretreatment may be omitted for routine analyses of lateritic soils.

The adsorption of proteins by montmorillonitic clays, L. E. ENSMINGER and J. E. GIESEKING. (Ill. Expt. Sta.). (*Soil Sci., 48 (1939), No. 6, pp. 467–473, pl. 1, fig. 1*).—The authors obtained X-ray diffraction data showing that albumin and gelatin are adsorbed within the characteristic expansible portion of the montmorillonite crystal lattice, and that these proteins are more completely adsorbed in suspensions with high H-ion concentrations than in suspensions with low H-ion concentrations. Untreated gelatin was more completely adsorbed than gelatin treated with nitrous acid to destroy its basic properties. The authors find their observations to suggest that the adsorption of proteins as cations is partly responsible for their combination with montmorillonite.

The influence of amino acids and proteins on nitrogen fixation by Azotobacter chroococcum, J. E. GREAVES, L. JONES, and A. ANDERSON. (Utah Expt. Sta.). (*Soil Sci., 49 (1940), No. 1, pp. 9–19, figs. 8*).—*A. chroococcum* was grown in a synthetic medium to which were added various quantities of glycine, leucine, *dl*-isoleucine, *dl*-valine, isovaline, *l*-aspartic acid, glutamic acid, *dl*-lysine, *d*-arginine, *dl*-methionine, cystine, tyrosine, phenylalanine, *l*-tryptophan, hydroxyproline, *l*-histidine, *l*-proline, casein, albumin, and gelatin. Its nitrogen-fixing powers, as affected by these adjuvants, were determined.

Tyrosine, *dl*-isoleucine, hydroxyproline, and *l*-histidine greatly increased nitrogen fixation by *A. chroococcum*. Phenylalanine and *d*-arginine materially retarded nitrogen fixation by *A. chroococcum*. The other amino acids tested either slightly increased fixation or were without effect. Cystine and *dl*-methionine increased nitrogen fixation approximately 20 percent, and their effects were very similar throughout the concentrations tested. Casein and albumin materially increased nitrogen fixation by *Azotobacter*, but gelatin greatly retarded it.

The mycorrhizal habit in relation to forestry.—III, Organic composts and the growth of young trees, M. C. RAYNER (*Forestry, 13 (1939), No. 1, pp. 19–35, pls. 4, figs. 3*).—With reference to the use of organic composts previously described,[a] an account is given of pot tests designed to analyze the growth effects induced by certain composts. Pot cultures of Scotch pine were grown in alternative series supplied respectively with composts and with equivalent amounts of lime and available nitrogen, potash, and phosphoric acid. These tests are believed to show conclusively that an increase in the supply of available nutrients plays a relatively insignificant role in maintaining a healthy and vigorous growth following additions of composts to the soil. The results also confirmed previous conclusions with respect to the existence of actively deleterious

[a] Forestry, 8 (1934), No. 2, pp. 96–125, pls. 9; 10 (1936), No. 1, pp. 1–22, pls. 6, figs. 7.

substances in the experimental soil and showed further that addition of organic composts ends the production of such substances, whereas addition of equivalent amounts of available nutrients as inorganic salts is practically without effect. That the strikingly beneficial effects on growth of conifers are closely bound up with the mycorhizal habit and the reactions of this on nutrition is deduced from the delicacy of response shown by these experimental plants with respect to short root development and from the histological changes induced in individual mycorhizas. It is known from studies in progress that profound changes in microbiological activities of the soil used follow addition of composts. The activation of the mycelium of specific mycorhiza-formers is one of these changes, and the stimulation of mycorhizal activity observed is an index of such activation and of the changed soil environment accompanying it. The bearing of the findings on the hypothesis of compost action presented and the relation of the latter to methods of litter control are discussed.

Effect of narrow carbon-nitrogen ratio and of naturally occurring tannins in decomposing plant materials upon the production of mucus, J. G. Shrikhande (*Soil Sci., 49 (1940), No. 1, pp. 1–8*).—The author found that initial high protein content of a plant material has no direct bearing on the amount of stickiness but indirectly affects it through the degree of decomposition. An apparent difference between the synthesized microbial protein and the original plant protein with respect to the production of stickiness was observed. The reaction developed being suitable, production of stickiness during fermentation appeared to be independent of the nature of the plant material, with the exception of plant materials containing tannin. The presence of tannins in refuse tea, tealeaf prunings, and gordonia was shown to exert a toxic effect on the microflora concerned in the decomposition, and the inhibition of mucus production appeared to be a microbial rather than a chemical process. Production of stickiness appeared to be an index both of the reaction and of the nature (aerobic or anaerobic) of the fermentation in compost piles of vegetable material.

Survival of Azotobacter in soil, H. Katznelson. (N. J. Expt. Stas.). (*Soil Sci., 49 (1940), No. 1, pp. 21–35, fig. 1*).—In a Palouse silt loam soil *A. chroococcum* survived when molybdenum and $CaCO_3$ were added alone or together. An increase in numbers occurred only in the presence of readily available sources of energy, such as mannite or glucose, as well as with ethyl alcohol and calcium acetate in appropriate concentrations (0.5 percent); at higher concentrations (1 percent), ethyl alcohol, butyl alcohol, and calcium benzoate completely suppressed *Azotobacter*. Alfalfa, straw, and manure neither stimulated the development of *Azotobacter* nor proved harmful. Dried blood was definitely injurious. Phosphate, alone or in combination with various organic materials (mannitol, glucose, straw, etc.), inhibited in concentrations of 1 and 0.5 percent. In pure culture a 1 percent concentration of K_2HPO_4 and KH_2PO_4, in the ratio of 9:1, markedly inhibited sugar consumption and nitrogen fixation. Counts of soil micro-organisms were significantly higher in the presence of K_2HPO_4, alone and particularly when combined with glucose or mannitol, than those of the same soils with carbohydrates alone. The unsuccessful competition with this microflora for nutrients was suggested as a probable explanation for the inhibition of *Azotobacter* in phosphate-treated soils. *A. chroococcum* when inoculated into four soils from the station experimental plats, which were modified by various treatments, persisted in two unlimed soils only upon addition of lime. The addition of readily available sources of energy to these soils, in the presence of lime, stimulated multiplication of *Azotobacter* to a certain extent. It was possible to recover the organism from the limed soils even after a considerable period had elapsed

after inoculation. Mannite or glucose enabled the organism to develop in the presence of $CaCO_3$.

Different soils were shown to vary in their ability to support *Azotobacter*, even when the reaction was favorable and readily available sources of energy were supplied. Unsuccessful competition with the microflora and microfauna of these soils, the presence of toxic substances, and the absence of certain nutrients, such as phosphate and potassium, are considered as among the factors probably responsible for the inability of *Azotobacter* to survive in these soils. These observations, with somewhat similar work on *A. indicum*, are considered to indicate that it is possible, by appropriate soil amendments, to establish *Azotobacter* and to stimulate its development in soils originally inimical to it.

The effect of natural gas on the growth of microorganisms and the accumulation of nitrogen and organic matter in the soil, H. J. Harper. (Okla. Expt. Sta.). (*Soil Sci., 48 (1939), No. 6, pp. 461–466*).—Dark-colored residues accumulate in soils exposed to natural gas and remain for several years after the gas leaks are repaired. Observations of areas where natural gas was escaping from leaking pipe lines into the soil indicated that microorganisms were active when moisture and temperature were favorable for growth.

Analyses of soil samples indicated that a marked increase in total nitrogen occurs in the affected areas. Species of *Clostridium* capable of fixing nitrogen under anaerobic conditions were present. The organic matter : nitrogen ratio was not constant in samples collected from different areas.

Report of the Chief of the Soil Conservation Service, 1939, H. H. Bennett (*U. S. Dept. Agr., Soil Conserv. Serv. Rpt., 1939, pp. 78*).—This report discusses the growth of soil conservation, the soil conservation district, department reorganization, a new philosophy, economics and conservation, the year's work, looking ahead, operations, research, physical surveys, cooperative relations and planning, information and education, and administration. Under research, data are reported on the work of the soil conservation experiment stations and other agencies on crop rotations, strip cropping, terraces, contour tillage, organic-matter additions, soil erodibility, climatic, physiographic, hydrologic, sedimentation, hilliculture, drainage, irrigation, economics of soil conservation, and submarginal-land purchase and development.

Publications on planning for soil, water, and wildlife conservation, flood control, and land utilization, E. G. Rogers and Z. E. McIlvain (*U. S. Dept. Agr., Soil Conserv. Serv., 1939, SCS–MP–21, pp. [5]+119*).—This bibliography is a revision of a list prepared in 1937 for the use of the Soil Conservation Service. In its present form it has been brought up to date and lists publications containing information pertinent to the land utilization, farm forestry, water facilities, and other programs established in or transferred to the Soil Conservation Service. The regions of the Soil Conservation Service have been used for the geographic arrangement. It is intended to include all publications pertinent to the Soil Conservation Service programs.

Selected annotated bibliography on sedimentation as related to soil conservation and flood control, C. B. Brown and F. F. Barnes (*U. S. Dept. Agr., Soil Conserv. Serv., 1939, SCS–MP–20, pp. [1]+40*).—From numerous articles on each of the several aspects of the sedimentation problem, the compilers of this bibliography have selected one or more papers on each of the more important phases of the subject and all papers that cover several phases and are more or less comprehensive. Especially the needs of personnel engaged in flood-control surveys, and the particular problems which they face, have been kept in mind. Each citation is accompanied by a brief abstract. Approxi-

nately half of the titles were noted in Miscellaneous Publication 312 (E. S. R., 80, p. 310).

Tests show valuable phosphorus leaves farm when topsoil is taken by erosion, R. GARDNER (*Colo. Farm Bul.* [*Colorado Sta.*], *2* (*1940*), *No. 1, pp. 4–6, figs. 2*).—The author points out that although the total phosphate content of the topsoil is usually but little, if at all, greater than that of the subsoil, the available phosphate content of the subsoil is usually much less than in the topsoil and is ordinarily in the deficient range of less than 40 p. p. m. The available phosphate content of a number of typical Colorado surface soils and subsoils is given, and the results of pot tests with corn and with alfalfa, grown in a number of topsoils and subsoils, are shown. The corn made much less growth in the subsoils, and the alfalfa very little growth.

Conserving soil through the farm program (*U. S. Dept. Agr., Agr. Adjust. Admin., South. Region Agr. Conserv., 1939, SRAC–6, pp.* [*1*]+*9, figs. 6*).—Questions pertinent to the soil-erosion problem and measures necessary for its solution in the southern part of the United States are stated and answered. The questions thus dealt with are of special application in Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, Oklahoma, South Carolina, and Texas.

Saving soil with sod in the Ohio Valley region, K. WELTON (*U. S. Dept. Agr., Farmers' Bul. 1836* (*1939*), *pp.* [*2*]+*30, figs. 17*).—Under good management, grass produces economical feed in pasture and meadow and increases yields on cropland when used in rotations or as a cover for the land when it is not in other crops. The use of grass in increasing the productivity of farm land, in conserving the soil on pasture and cropland, and in protecting smaller eroded or erodible areas is discussed. The recommended practices have general application throughout the Ohio River drainage basin and Michigan.

Mulching to establish vegetation on eroded areas of the Southeast, S. FRANKLIN (*U. S. Dept. Agr. Leaflet 190* (*1939*), *pp. 8, figs. 6*).—Green pine branches have proved to be the most successful mulch. The branches should be cut about 3 or 4 ft. long and always laid with the butts in the direction of the immediate run-off. The ends of the pine needles are in this way held close to the ground in the best position to catch silt. Grain straw and pine litter as mulch provide good protection for germination and early plant growth, but they do not furnish shade later for the young plants as the pine brush does. Cane bagasse also is satisfactory as a mulch if it has weathered a year before it is used, but an acid in freshly pressed cane begasse seems to be toxic to newly sprouted seedlings. Another good mulch material consists of *Lespedeza sericea* stems. In some instances the stems from which the seed have been flailed are used as mulch. Enough seed often remains attached to the stems to give satisfactory stands, but this cannot be relied upon as a general practice. When unthreshed *L. sericea* is used as mulch, satisfactory stands are obtained almost without fail. Premulching (application of a mulch well in advance of seeding) was found advisable in some situations. The use of annuals for temporary ground cover, mulch, and protection for the perennial plant was effective for eroded field borders and other gailed strips which could be prepared with farm machinery. It is noted that for this use the plant chosen must be capable of free growth on poor sites, must produce a considerable bulk of stalk and leaves, and must not reseed readily. Browntop millet, Sudan grass, and common sorghum have thus far met these requirements with most success.

'40 Recommendations for use of fertilizer on Mississippi farms: Kinds, quantities listed for range of crops and soils, C. DORMAN (*Miss. Farm Res.* [*Mississippi Sta.*], *3* (*1940*), *No. 1, pp. 1, 8, fig. 1*).—General recommendations as to formula and time and manner of application of fertilizer are given for each of 10 sections indicated on an accompanying map of the State.

Progress report of phosphate and other fertilizer investigations at the Aberdeen Branch Experiment Station, University of Idaho, J. L. Toevs and G. O. Baker. (Coop. U. S. D. A. et al.). (*Idaho Sta. Bul. 230 (1939), pp. 27, figs. 5*).—The following are a part of the observations recorded: No significant increases have been obtained thus far from the use of gypsum or sulfur for alfalfa. The higher the lime content of a soil, the greater is the possibility that phosphate fertilization will be advisable. A response of alfalfa to phosphate fertilization less pronounced at the beginning of the experiments than in more recent years indicates a definite relationship between the length of time land in southern Idaho is under cultivation and the quantity of available phosphorus in the soil. This may be due to either an increase in the lime in the surface soil, a decrease in soil phosphate, or both. The average yields of red clover seed were more than doubled by the use of treble superphosphate. In the red clover seed-producing areas, phosphate fertilization is recommended. Phosphate fertilization of potatoes indicates that when potatoes are grown in a balanced rotation in which the legumes, particularly red clover and alfalfa, have had sufficient available phosphorus for proper development, the use of available phosphate fertilizers for potatoes is not profitable. Where nitrogen is out of balance with phosphorus or in excess of plant requirements, from 100 to 200 lb. of available phosphate fertilizer is desirable. In spite of the high average yields of potatoes obtained at the substation, nitrogenous fertilizer on land of at least average fertility and in proper rotation gave profitable returns. Barnyard manure or a nitrogenous fertilizer where manure is not available in sufficient quantities is recommended for the average land used for potatoes. The value of legumes in rotations is improved by the application of available phosphates to the legumes, in that the following cultivated crops benefit from the improved legume growth by the greater amount of organic residues and nitrogen returned to the soil when the legume is plowed up. When 75, 125, 200, and 300 lb. of treble superphosphate per acre were applied on alfalfa, the 300-lb. application gave the greatest increase in yield, but the most economic returns were obtained from the 75- and 125-lb. applications. However, the residual effect from the heavier application and the increased quantity of organic matter may justify the higher rate.

Retention by soils of the nitrogen of urea and some related phenomena, J. P. Conrad and C. N. Adams. (Univ. Calif.). (*Jour. Amer. Soc. Agron., 32 (1940), No. 1, pp. 48–54, fig. 1*).—Urea solutions were percolated through columns of dry soil, and the columns were subsequently sectioned. The response of milo was used to indicate the final distribution of the nitrogen applied in the urea. Untreated soils progressively removed at least some of the nitrogen of urea and of calcium cyanamide from solutions as they percolated through them. This property of the untreated soils was largely lost by percolating urea at 90° C., but persisted at 2°, 11°, and 40°.

The growth results as well as the analyses of the small amount of percolates from the columns "are in agreement with the hypothesis that adsorption and a thermolabile catalysis were perhaps largely responsible for the retention of the nitrogen of urea by the untreated soil."

Ammoniated peat—effect of varying the conditions of ammonia treatment on nitrogen quality, R. O. E. Davis and W. Scholl. (U. S. D. A.). (*Indus. and Engin. Chem., 31 (1939), No. 2, pp. 185–189, figs. 5*).—In the ammoniation process, some factors tending to increase the total nitrogen content also reduced the activity of the insoluble nitrogen, while other variations of the procedure increased the activity at the expense of lowering the total nitrogen content. Of the products prepared from the peat employed, those

having the most desirable properties were treated at 130° C. from 2 to 4 hr. with ammonia: peat ratios of 0.4 : 1 and moisture content of the peat from 28 to 40 percent. The products contained from 5 to 8 percent nitrogen, of which from 18 to 25 percent was soluble with activities of the insoluble portion from 70 to 78 percent and from 45 to 52 percent by the neutral and alkaline permanganate tests, respectively. In pot tests in which carrots were used as the test crop, the best of the ammoniated peat preparations gave as good yields as did cottonseed meal, nearly as good as those from sodium nitrate, and better than those given by urea or ammonium sulfate.

Availability, fixation, and liberation of potassium in high-lime soils, H. ALLAWAY and W. H. PIERRE. (Iowa Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 11, pp. 940–953, fig. 1*).—Unproductive high-lime soils from 9 different fields in north-central Iowa were compared with soils from the same fields which supported normal crop growth. Within any given field the productive soil contained from 31 to over 700 percent more exchangeable potassium than the unproductive soil. The latter averaged 151 lb. of exchangeable potassium per acre (2,000,000 lb.), whereas the productive soils averaged 396 lb. Seven of the 10 unproductive soils contained less than 175 lb. of exchangeable potassium per acre, whereas all 12 of the productive soils contained more than this quantity. The unproductive soil was generally higher in calcium carbonate than the productive soil from the same field, the average content of the former being 24 percent, and of the latter 12.6 percent. Eight of the 12 productive soils contained less than 15 percent calcium carbonate in the surface 6 in., whereas 9 of the 10 unproductive soils contained more than this quantity. In every field, the unproductive soil showed a greater potassium-fixing power than the productive soil. The average proportion of potassium fixed by 10 unproductive calcareous soils was 211 lb. per acre, by 12 calcareous productive soils 105 lb., and by 10 acid soils only 13 lb. In 4 out of 5 fields studied the productive soils showed a more rapid liberation of nonexchangeable potassium, although the differences were relatively small.

The authors concluded that differences in the amounts of exchangeable potassium present may account, at least in part, for the differences in plant growth between unproductive high-lime soils and adjacent soils which support normal plant growth. The high-lime soils of Iowa apparently require more exchangeable potassium in order to support good crop growth than do the normally acid soils of central United States. Excessively high concentrations of calcium carbonate and bicarbonate may contribute, either directly or indirectly, to the low productivity of these soils. On the basis of the relatively few soils studied in this investigation, it would appear that soils of north-central Iowa which contain more than 15 percent calcium carbonate and less than 175 lb. of exchangeable potassium per acre are likely to show signs of extreme potassium deficiency and to respond markedly to potassium fertilization. Some high-lime soils containing more than this proportion of exchangeable potassium may also give good response to potassium fertilization. The high potassium-fixing power of unproductive high-lime soils may be responsible for the relatively low amounts of exchangeable potassium in these soils and no doubt explains the small residual effects obtained from applications of potassium fertilizers.

A soil zinc survey in California, P. L. HIBBARD. (Univ. Calif.). (*Soil Sci., 49 (1940), No. 1, pp. 63–72*).—In general the zinc found amounted only to from 1 to 5 p. p. m., though some samples contained much more. Zinc as well as some other minor metals were found often to be accumulated in the surface soil by action of vegetation, this accumulated zinc being only very

slowly leached down because of the high fixing power of soil for zinc. Many samples of rock associated with the soil were found to have a zinc content similar to that of the soil, indicating that the soil was derived from the rock. Although the zinc content of soils from different regions was sometimes found very different, the author considers it probable that soil-forming agencies, excepting vegetation, tend to produce soils having a similar content of zinc and other minor metals. Though the amount present may be adequate, the zinc in alkaline soils appeared to be relatively unavailable to some species of plants.

Toxic limits of replaceable zinc to corn and cowpeas grown on three Florida soils, O. E. GALL and R. M. BARNETTE. (Fla. Expt. Sta.). (*Jour. Amer. Soc. Agron., 32 (1940), No. 1, pp. 23–32, fig. 1*).—By the use of soils which had been previously saturated with replaceable zinc and washed free from soluble salts, combined in varying proportions with the corresponding air-dried untreated soils to give a suitable range in concentration of replaceable zinc in each soil, it was found that replaceable zinc became toxic to corn on a Norfolk sand between the concentrations of 0.688 and 1.376 milligram equivalents per 100 gm. (451–902 lb. Zn per acre), between 0.758 and 1.137 m. e. on an Orangeburg fine sandy loam, and between 1.615 and 2.153 m. e. on a Greenville clay loam. The corresponding toxicities for cowpeas were the concentrations of 0.275 and 0.482, 0.379 and 0.758, and 0.538 and 1.077 m. e. The application of monocalcium phosphate at the rate of 233 lb. per acre to the Norfolk sand and 1,800 lb. per acre to the Orangeburg fine sandy loam and the Greenville clay loam did not change the toxic limits of the replaceable zinc for corn or cowpeas. The presence of phosphate as a plant nutrient, however, stimulated the growth of corn and cowpeas on the Orangeburg fine sandy loam and the Greenville clay loam, while no effect was noted on the Norfolk sand. The use of calcium carbonate at the rate of 1,000 lb. per acre on the Norfolk sand and 4,000 lb. per acre on the Orangeburg fine sandy loam and the Greenville clay loam definitely increased the concentrations at which replaceable zinc became injurious to corn and cowpeas and greatly alleviated the toxic condition.

The effect of calcium arsenate upon the productivity of several important soils of the Cotton Belt, C. DORMAN, F. H. TUCKER, and R. COLEMAN. (Miss. Expt. Sta. and U. S. D. A.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 12, pp. 1020–1028*).—Plats of seven representative Cotton Belt soils were treated with from 50 to 1,600 lb. per acre of calcium arsenate. Neither germination nor seedlings were injured on any soil until 400 lb. per acre or more of calcium arsenate were applied. The greatest injury from the heavier applications occurred in the seedling stage, and the extent of this injury depended upon the nature of the soil type. Crop yields from oats, Austrian peas, and hairy vetch planted immediately after the arsenic was applied and 1 yr. later show that yields were not affected except by heavy treatments, and much of the toxicity was lost during 1 year's time. Oats seemed more sensitive to arsenic than Austrian peas and hairy vetch, but all crops grown on Norfolk, Ruston, and Cahaba sandy loams were injured more than those grown on heavier soils. Large quantities of water-soluble arsenic did not accumulate in any soil until 400 lb. of calcium arsenate had been added, and then only in the sandy soils. Large quantities were lost from the heavily treated soils in 1 year's time. The soils most sensitive to arsenates (Norfolk, Cahaba, and Ruston sandy loam) contained the least clay, iron, aluminum, calcium, and magnesium, while Houston clay loam, the soil least affected by calcium arsenate, contained the largest quantity of these constituents. It is concluded that the average application of calcium arsenate for insect control will probably never cause enough accumulation to injure crops usually grown on the soils used in this study.

Effect of waste sulfite liquor on soil properties and plant growth, J. R. SPULNIK, R. E. STEPHENSON, W. E. CALDWELL, and W. B. BOLLEN. (Oreg. Expt. Sta.). (*Soil Sci., 49 (1940), No. 1, pp. 37–49, pl. 1, figs. 2*).—Waste sulfite liquor in concentration below 80 tons per acre was not toxic to sunflowers grown in Newberg loam. It proved a satisfactory source of sulfur for sunflowers grown on sulfur-deficient soils, definite increases in yield being obtained; increased the concentration of potassium, calcium, and sulfate salts in the water extract of the soil and decreased the nitrate content; increased the rate of carbon dioxide evolution in the soil, indicating an increased organic decomposition, and increased the microbial population in the soil; and it lowered the pH of the Newberg loam soil suspension. On incubation the pH gradually increased.

Commercial fertilizer report for 1939, J. T. SPARLING and E. BURKE (*Montana Sta. Bul. 376 (1939), pp. 14*).—This bulletin contains (part 1) the Montana fertilizer law, showing revisions made in 1939, and (part 2) a discussion of the fertilizers examined, selection of fertilizers, calculation of fertilizer costs, and the analytical data for the 1939 inspection.

Inspection and analysis of commercial fertilizers, B. D. CLOANINGER (*South Carolina Sta. Bul. 324 (1939), pp. 153*).—In discussing provisions of the new fertilizer law prohibiting the sale of low-analysis fertilizers, the author of this 1939 report on fertilizer analysis data notes that "South Carolina farmers have been paying over one million dollars annually for sand or other inert materials mixed in low-grade fertilizers."

AGRICULTURAL BOTANY

Earth's green mantle: Plant science for the general reader, S. MANGHAM (*New York: Macmillan Co., 1939, pp. 322, pls. [41], figs. 42*).—In his foreword to this book, A. W. Hill says "in the course of the 11 chapters the author treats on almost every conceivable part which the vegetable kingdom, in its many aspects, plays or has played in the past in the economic welfare of mankind."

Botany: A textbook for college and university students, W. J. ROBBINS and H. W. RICKETT (*New York: D. Van Nostrand Co., 1939, 3. ed., rev., pp. IX+[1]+658, [pl. 1], figs. 440*).—This is a revision of the work previously noted (E. S. R., 65, p. 23), bringing the subject matter more nearly up to date.

Abstracts of the papers presented before the general section of the Botanical Society of America, Columbus, Ohio, December 28 to 30, 1939 (*Amer. Jour. Bot., 26 (1939), No. 10, Sup., pp. 1, 2, 3, 4, 5, 6–8, 9, 10*).—Of interest to agricultural botany, the following are included: Formation of Cellulose Particles in *Halicystis* sp., by W. K. Farr; Erie Black as an Aceto-Carmine Auxiliary Stain, by B. R. Nebel (N. Y. State Expt. Sta.); Teaching Aids in Botany—I, The Placement Test, by S. M. Dietz and C. J. Gould, Jr. (Iowa State Col.); Somatic Doubling of Chromosomes and Nodular Infection in Certain Leguminosae, by L. Wipf and D. C. Cooper (Univ. Wis.); The Physiological and Genetic Effects of X-Rays, by K. Sax.; Seed Patterns in *Lilium* and Their Significance, by A. B. Stout; Inheritance of Seed-Coat Color in Peanuts, by B. B. Higgins (Ga. Sta.); Developmental Pattern of the Leaf Blade in 2*n* and 4*n* *Zea mays* as Related to the Structure of the Growing Point, by E. C. Abbe, L. F. Randolph, and J. Einset (Univ. Minn., U. S. D. A., and Cornell Univ.); Polyploidy and Winter Hardiness Relationships in the Flowering Plants With Reference to Karyogeographical Problems, by W. M. Bowden; A Preliminary Investigation of the Acenaphthene Response Seen in Certain Seedlings, by A. O. Dahl; The Oxygen Consumption of Isolated Woody Tissues, by R. H. Goodwin and D. R. Goddard; A Botanical Survey of Bois Blanc Island, Mackinac

County, Mich., by M. T. Bingham; Distribution of Bright Belt Tobacco Roots in Relation to Soil Profile, by L. J. Gier; Development of the Nut Grass Plant (*Cyperus rotundus* L.), by J. R. Jackson and E. V. Smith (Ala. Sta.); A Comparative Study of the Subterranean Members of Several Crop Plants, by H. J. Dittmer; Methods in Aerobiology, by O. C. Durham; Changes in Grassland Vegetation in Western North Dakota, 1932 Through 1939, by W. Whitman, H. C. Hanson, and R. Peterson (N. Dak. Sta.); Species Senescence, by S. A. Cain (Univ. Tenn.); Plant Ecology—The Two Uses of the Term, by F. E. Egler; Vegetation of a High Mountain Valley in Southern Colorado, by F. Ramaley; Unrecognized Initial Stage of Plant Succession and Its Prominence in Soil Erosion Control in the South-Central United States, by W. E. Booth; Further Studies on Zonal Structure and Growth in the Shoot Apex of *Cycas revoluta*, by A. S. Foster (Univ. Calif.); Embryogeny of *Torreya nucifera*, by J. T. Buchholz, and A Statistical Study of Two Variables in the Sequoias—Pollen Grain Size and Cotyledon Numbers, by J. T. Buchholz and M. Kaeiser (both Univ. Ill.); The Embryogenies of *Biota* and *Thuja*, by P. L. Cook; The Development of the Embryo of Barley, by J. Merry; Relative Growth of Different Radii in Cross-Sections of Developing Ovaries of *Iris fulva* and *I. hexagona* var. *giganticaerulea*, by H. P. Riley; Factors Responsible for the Development and Distribution of the Endodermis in Monocotyledonous Plants, by D. S. VanFleet; The Occurrence of Vessels in the Monocotyledoneae, by V. I. Cheadle (R. I. State Col.); The Relation Between Plane of Cell Division and Organ Form in Cucurbit Fruits, by E. W. Sinnott; The Peg of the Cucurbits—A Structure Induced by Growth Hormone? by C. D. LaRue; Cell Number in the *Avena* coleoptile, by G. S. Avery, Jr. and H. B. Creighton; and Growth and Differentiation of Corn Plants in Relation to Nitrogen Supply, by I. McVeigh and P. R. Burkholder (Univ. Mo.).

[Botanical studies by the Iowa Station] (*Iowa Sta. Rpt. 1939, pt. 1, pp. 107–109*).—Brief reports are given of studies of the structure of the seed coat and environal factors pertaining to germination of weed seeds, by J. N. Martin; and distribution and ecology of plants in the waterfowl breeding area of Iowa, by A. Hayden.

[Plant physiological studies by the Maryland Station] (*Maryland Sta. Rpt. 1939, pp. 42–46*).—Brief reports of progress are included on the physiological and biochemical aspects of sweetpotato storage; the relation between vernalization and the activity of plant growth regulators, flowering substances, etc., in relation especially to root initiation and elongation and shoot initiation and elongation; and the time rate of oxygen respiration in some cereals in relation to total natural and imbibed water and to the ratio of free and bound water.

[Botanical studies by the Cornell Station] (*[New York] Cornell Sta. Rpt. 1939, pp. 121, 122*).—Brief reports on progress are included for investigations of delayed photosynthesis in chlorophyll-bearing embryos of orchids and the germination of orchid seeds, by L. Knudson; and the storage and germination requirements of seeds of 15 species of *Polygonum*, by W. C. Muenscher and O. L. Justice.

Studies in tree physiology, I, II, R. D. Gibbs (*Canad. Jour. Res., 17 (1939), No 12, Sect. C, pp. 460–482, figs. 6; 18 (1940), No. 1, Sect. C, pp. 1–9, figs. 3*).—Two papers are presented:

I. *General introduction. Water contents of certain Canadian trees.*—Previous work and further problems involved are first discussed. In *Betula alba papyrifera*, in at least the young parts of *B. alba pendula laciniata*, in *B. populifolia*, and in several sizes of *Populus tremuloides* the author found a marked seasonal rhythm in water content, the maximum occurring at leaf opening and the

minimum at leaf fall. In poplar but not in birch there was a very high water content in December. During winter a considerable water loss may occur. A winter loss was also shown by the wood of hemlock and larch and by twigs and leaves of white pine and hemlock. Losses from leaves were surprisingly small. The behavior of *B. populifolia* was studied for more than 3 yr., and differences were correlated with observations on the weather. Experimental work on water movement in this tree during winter has thus far given inconclusive results. There are 16 references.

II. *Seasonal changes in the food reserves of field birch (Betula populifolia Marsh.)*—From January 1936 to July 1938 the upper parts of *B. populifolia* were analyzed for water, reducing sugars, sucrose, total soluble sugars, ether-soluble material, polysaccharide hydrolyzable by takadiastase, and residual polysaccharides extracted by dilute acid. Of the takadiastase hydrolyzate from the wood, 38-63 percent was nonfermentable and presumably pentose. The residual acid extract was 69-100 percent nonfermentable. Hexosan was low in winter, rose to a maximum just before leaf opening, decreased sharply during spring growth, and accumulated in summer. Ether-soluble material was not stored in winter. Sucrose and to a lesser extent reducing sugars were high in winter. There was a significant correlation between reducing sugars and water content of the twigs. Food reserves in the cortex behaved much like those in the wood. There are 20 references.

The forces concerned in the intake of water by transpiring plants, P. J. KRAMER (*Amer. Jour. Bot., 26 (1939), No. 10, pp. 784-791, figs. 2*).—Using potted coleus, hibiscus, balsam, sunflower, and tomato plants, it was found that the rate of exudation from detopped root systems was only 1-5 percent of the transpiration rate from similar intact plants. When the tops were removed from freely transpiring plants, frequently there was no exudation, water at first being absorbed through the freshly cut stem surfaces and exudation beginning only after 0.5-2 hr. and in some tests not until after watering the soil. Since it has previously been shown that intact plants can absorb water from much more concentrated solutions than can detopped root systems, it seems apparent that the greater part of the forces behind intake of water originate in the transpiring shoots rather than in the living cells of the roots. Root pressure has never been reported for gymnosperms, and it is deemed probable that active absorption does not occur in that group. It therefore seems doubtful whether active absorption is essential to other groups of seed plants. It is concluded that active absorption, as shown by exudation and root pressure phenomena, is wholly inadequate to supply the water requirements of transpiring plants, and it is believed possible that active absorption does not even supplement passive absorption in rapidly transpiring plants, since none of the suggested mechanisms for physiological absorption would operate without turgidity of the root cells. It is suggested that root pressure may be a fortuitous result of the root structure and of the way in which minerals are absorbed by some plants. Most, and under certain conditions possibly all, of the water absorbed by transpiring plants is said to be absorbed as a result of forces set in motion by transpiration losses. "Removal of water in transpiration decreases the pressure or causes tension on the water in the xylem, producing a gradient of decreasing pressure and increasing diffusion pressure deficits along which water moves by mass flow and to some extent by diffusion from the epidermis to xylem. The roots act as passive absorbing surfaces in such a mechanism, but healthy growing root systems are very important because extension of roots through the soil continually makes available new supplies of moisture."

Respiration and fermentation in the carrot, Daucus carota.—II, Fermentation and the Pasteur effect, P. B. MARSH and D. R. GODDARD (*Amer. Jour.*

Bot., *26* (*1939*), *No. 10*, *pp. 767–772*, *fig. 1*).—In continuation of this study (E. S. R., 82, p. 458), the results here presented are believed to demonstrate clearly the existence of the Pasteur effect (increased rate of sugar decomposition in transferring tissues from air to N_2) in carrot root tissue, and also that with cyanide inhibition of respiration in excess of 45–50 percent there is a direct effect of respiration on the inhibition of fermentation. Sodium azide and CO also induce aerobic fermentation, and the CO effect is reversed by light. These results are not deemed consistent with the theory of the oxidation of a fermentation enzyme unless the oxidation is catalyzed by cytochrome oxidase, but they are consistent with (though giving no proof for) the oxidative resynthesis theory. Direct proof of this theory for a higher plant may be obtained only by simultaneous analysis for carbohydrate, alcohol, CO_2, and O_2, and such information is not yet available for any single plant. The Pasteur effect was not poisoned by ethyl isocyanide, low O_2 pressures, or by cyanide.

Hydrogen-ion concentration of leaf juice in relation to environment and plant species, A. M. Hurd-Karrer. (U. S. D. A.). (*Amer. Jour. Bot.*, *26* (*1939*), *No. 10*, *pp. 834–846*, *figs. 2*).—The pH values of expressed leaf juice of normal, vigorous wheat during the vegetative period were 5.85–6.38, but more usually between 5.9 and 6.2. During maturation the acidity increased, the pH value falling to ±5.5, or rarely as low as 5.3. Unhealthy plants became prematurely acid, but none reached values lower than pH 5.3. Both high temperatures (above 20°C.) and lengthened light periods (17 hr.) tended to increase acidity under the test conditions, thus accounting for the abnormal acidity of spring-sown winter wheat, which grows poorly and fails to head. The extent to which high temperatures increased acidity depended on the extent to which it injured the plants. Thus acidity at higher temperatures was determined by the temperature requirement of the individual variety. There was no significant varietal difference in the pH values for plants grown under conditions equally favorable for normal development. The only environal factor found to reduce acidity was a shortened light period (8 hr.), which favored vigorous vegetative development. The pH values for week-old seedlings grown in darkness averaged slightly but probably not significantly lower than those grown in the light. Liming the soil had no effect on the juice acidity, presumably because there was no effect on the vigor of growth. A compilation from the literature (52 references) for other plants showed a range from ±pH 1 for *Begonia* to ±pH 7 for occasional samples of the least acid crop plants, with the majority at pH 5.5–6.5

Root activity and the oxygen requirement in relation to soil fertility, K. S. Karsten (*Amer. Jour. Bot.*, *26* (*1939*), *No. 10*, *pp. 855–860*, *figs. 4*).—A mercury cathode method described proved convenient and successful for the quantitative determination of oxygen in soils. The results of the experiments reported show that the O_2 content of soils varies with soil type, water and nitrogen contents, and organic matter, including micro-organisms. The O_2 contents of various soils presented were less than might be calculated on the basis of water content and pore space, due to the fact that the composition of the soil atmosphere is modified by soil micro-organisms. A reduced O_2 content and reduced rate of plant growth (potted wheat seedlings) resulted from soil treatments with starch and $(NH_4)_2SO_4$.

Physiological factors in reproduction of plants, A. E. Murneek. (Univ. Mo.). (*Growth*, *3* (*1939*), *No. 3*, *pp. 295–315*, *figs. 9*).—This analytical review (73 references) considers the theories and experimental evidence on initiation of the reproductive state, the nutritional and hormonal theories of reproduction, chief aspects of flower production, fertilization and formation of the zygote, and the influence of seeds and fruit on the mother plant.

Growth and reproduction as problems in the synthesis of protein molecules, A. Gulick. (Univ. Mo.). (*Growth, 3 (1939), No. 3, pp. 241–260, figs. 17*).—This symposium paper, including discussions of enzymes and viruses, presents a survey of several concepts applicable to the fundamental processes of life "in a manner that contracts into much-narrowed dimensions the gulf that has seemed so unbridgeable between things living and things nonliving."

Nature of growth differences in two sorghum varieties.—I, Influence of preliminary soaking on early growth and auxin content, R. Pratt and H. G. Albaum. (Univ. Calif. et al.). (*Amer. Jour. Bot., 26 (1939), No. 10, pp. 822–826, figs. 2*).—Yellow Milo and Dawn Kafir seeds were soaked in distilled water for different periods of time, and after germination had occurred they were placed on perforated corks arranged so that the roots dipped into distilled water, the subsequent growth of roots and shoots (internodes plus coleoptiles) being observed for 2–3 days. Growth of the Kafir seedlings was not appreciably affected by the different treatments, but that of the Milo was markedly altered. The shoot length at any time was inversely related to the duration of the previous period of soaking. However, root growth increased directly with the previous period of soaking up to 24 hr., but was retarded by longer immersion. The ratio obtained when the mean root length was divided by the mean shoot length increased directly with the previous period of immersion, indicating that shoot growth was retarded relatively more than root growth. The effects on growth were most pronounced in the very early developmental stage.

Auxin assays by the oat-coleoptile test indicated that its content in dry seeds of the two varieties was essentially the same but that after the treatments Kafir seeds contained considerably more than the Milo. Before and after soaking the relative auxin concentrations in Milo seeds were ±75 and ±45 percent, respectively, of those in Kafir seeds. It is suggested that three factors may be involved, viz, rate of auxin formation, permeability of seed coats, and distribution of auxin between endosperm and embryo. The evidence seems to indicate that Dawn Kafir seeds are much less permeable to auxins than those of Yellow Milo. The study also showed that unmutilated, auxin-deficient seedlings may be readily produced under experimental conditions. Such seedlings may prove useful agents in studies of the physiological role of growth substances in plant cells.

Growing plants in nutrient solutions or scientifically controlled growth, W. I. Turner and V. M. Henry (*New York: John Wiley & Sons; London: Chapman & Hall, 1939, pp. XIII+154, pls. 3, figs. [30]*).—This is a compendium of information on the scientific basis of growing plants in nutrient solutions and on its application. A chapter on diagnosing deficiency symptoms, a bibliography, specimen record sheets, and an index and glossary are included.

Growth substances in agar, W. J. Robbins (*Amer. Jour. Bot., 26 (1939), No. 10, pp. 772–778, figs. 6*).—A beneficial effect of Difco agar on spore germination and on gamete and zygote growth and formation by *Phycomyces blakesleeanus* is reported. The active substance was extracted in part with dilute methyl alcohol and more fully with aqueous pyridine. Since the media used contained minerals (including micro-essential elements), sugar, asparagine, and thiamin, it is believed that the beneficial effect of the agar was due to unknown growth substances. Agar was found to contain appreciable amounts of biotin and traces of thiamin or its intermediates. Potato, brown sugar, oatmeal, and corn meal favorably affected development of the fungus in the presence of thiamin, and they probably contain the same unknown growth substances believed to be in agar. The possibility of growth substances occurring in agar is a factor to be considered in its use for experiments with organisms.

Differential growth in plant tissues.—II, A modified auxin test of high sensitivity, K. V. THIMANN and C. L. SCHNEIDER (*Amer. Jour. Bot.*, *26* (*1939*), *No. 10*, *pp. 792–797*, *figs. 9*).—Continuing these studies (E. S. R., 80, p. 744), an assay method is here described in which *Avena* coleoptiles are slit into four parts longitudinally and these slices allowed to curve in auxin solutions. The test is said to be some 30 times as sensitive as the *Avena* test with agar and to detect concentrations of indoleacetic acid as low as 0.1γ per liter. Various factors affecting the test are discussed, and examples are given of its use for dilute auxin solutions and for comparisons of different auxins. It is noted that the increased sensitivity of the test is probably in the main to be ascribed to mechanical factors affecting the curving sections. The essential features are believed to support the view that curvatures of this type are due to inherent differences in the auxin responses of adjacent tissue layers.

Treatment of seeds with indolebutyric acid and its effects, D. E. WEIMER (N. Y. State Expt. Sta.). (*Assoc. Off. Seed Anal. North Amer. Proc.*, *30* (*1938*), *pp. 263–268*).—The results obtained led to the conclusion that seed treatment with indolebutyric acid at 1 : 800,000, 1 : 400,000, 1 : 100,000, and 1 : 25,000 inhibits germination and also causes abnormal seedlings. Many of the abnormal sprouts normally found in routine germination tests were duplicated by such treatments, which might suggest that seeds may normally contain an auxin and that when it occurs in too high a concentration it acts as an inhibitor. "Even the most lethal poison can be used as a valuable therapeutic agent if taken at the proper time in the proper dosage. Indolebutyric acid may be just such a potential treatment for seeds, and the concentrations which were tested may have been too great to stimulate growth."

The synthesis of vitamin B_1 and B_2 (complex) by the yeast Torula utilis [trans. title], A. SCHEUNERT, K. H. WAGNER, H. FINK, and J. KREBS (*Biochem. Ztschr.*, *302* (*1939*), *No. 1–2*, *pp. 1–11*, *figs. 2*).—*T. utilis* cultured on such vitamin-free media as xylose and inorganic salts or dilute alcohol and inorganic salts always contained vitamins B_1 and B_2 (complex). Biological assays reported in detail as to the technic and the findings indicated a content of 8 International Units of vitamin B_1 and 10 Bourquin-Sherman units of vitamin B_2 per gram of dry yeast for growths cultured on the former medium and of 6 and 13.3 units, respectively, for the first generation on the latter medium; even after 11 transfers in this alcohol and inorganic salt medium, the culture yielded 3.3 I. U. of vitamin B_1 and 10 Bourquin-Sherman units of vitamin B_2 per gram of yeast. Since there was a threefold multiplication in the weight of yeast with each transfer, it is evident that these vitamin values can be accounted for only by synthetic activity of the organism. It remains uncertain whether there is any weakening of the synthetic ability with successive transfers.

The effect of boron in the substrate on calcium accumulation by soybean plants, C. E. MINARIK and J. W. SHIVE (N. J. Expt. Stas.). (*Amer. Jour. Bot.*, *26* (*1939*), *No. 10*, *pp. 827–831*, *figs. 2*).—The production of fresh tissue by soybean plants as well as the Ca percentage in the leaves is said to be conditioned by the concentration of B in the nutrient solution. Both deficient and toxic amounts of B in the substrate resulted in low yields and subnormal Ca in the tissues. The optimum range of B in the substrate was found to be ±0.025–1 p. p. m. Within the range of concentrations used in this study the percentage moisture in soybean plants decreased with increasing B concentrations in the nutrient solution, thus supporting the theory that B may be a regulator of water absorption by the plasma colloids. The ash content of the leaves did not vary significantly with variations in B concentration in the nutrient solution, but the Ca content of the ash was influenced by the B

content of the substrate, both excess and deficiency of B in the substrate corresponding with low percentage values for Ca in the ash.

Radiation effects on biological substances, including genes and viruses, J. W. Gowen (*Iowa Sta. Rpt. 1939, pt. 1, pp. 160, 161, 162*).—This is a progress report on studies planned to throw light on the nature of viruses and the mutant changes which they undergo. Viruses of *Nicotiana sylvestris*, *N. glutinosa*, and garden beans, two animal viruses, and bacteria constituted the test material.

The nature of absorption of radioactive isotopes by living tissues as illustrated by experiments with barley plants, R. Overstreet and T. C. Broyer. (Univ. Calif.). (*Natl. Acad. Sci. Proc., 26 (1940), No. 1, pp. 16–24, figs. 2*).—From considerations of equilibria, it is concluded that plant roots may absorb radioactive ions through a simple exchange of radioactive isotopes of the surrounding medium for nonradioactive isotopes initially present in the plant. Barley plants with low potassium levels absorbed radioactive and nonradioactive isotopes of K in nearly constant proportions from dilute KCl solutions in which the radioactivity of the dry salt was of the order of 1 microcurie per liter. Under similar conditions, barley plants with moderately high K levels favored the radioactive isotope in absorption. Under the experimental conditions, plants with high K levels or those maintained at low temperatures did not show a net absorption of K but did absorb radioactive K, indicating a process of exchange of radioactive isotopes in the medium for nonradioactive isotopes in the roots. The fraction of K in the roots capable of rapid exchange for isotopes in the medium was calculated. This fraction is believed to be associated with the colloidal phases of the protoplasm and cell wall, and thus may have a special significance for the study of certain aspects of the ionic interrelations of the root and culture medium.

Stimulation of growth in Aspergillus niger under exposure to low velocity cathode rays, C. E. Buchwald and R. M. Whelden (*Amer. Jour. Bot., 26 (1939), No. 10, pp. 778–784, figs. 4*).—It is claimed to have been proved that, when irradiated with cathode rays of certain energies and densities and later cultured on potato-maltose agar, spores of *A. niger* are definitely stimulated in growth. Earlier signs of, and more rapid, swelling, a larger average size, and a higher percentage of germ-tube production were all noted for the irradiated samples as compared with controls. A very large volume of data was obtained in this connection, and three statistical tests—the binomial law, the Student t-test, and the chi-squared test—applied separately to them all indicated significance. These stimulative effects were observed only at relatively low cathode ray energies of the order of 1.5–3 kv. No definite explanation is yet attempted, but some suggestions are made.

Factors influencing the efficiency of photosynthesis, R. Emerson and C. M. Lewis (*Amer. Jour. Bot., 26 (1939), No. 10, pp. 808–822, figs. 2*).—In this study of the dependence of the quantum yield of photosynthesis in *Chlorella pyrenoidosa* on various factors, high yields were found to be favored by traces of certain heavy metals in the medium, and the conditions during growth of the cultures and measurement of photosynthesis also influence the apparent quantum yield. With favorable conditions, yields as high as 0.23 molecule of CO_2 per absorbed quantum were obtained, with indications of still higher efficiency possibilities. It has been thought that photosynthesis represents the complete synthesis of carbohydrate from CO_2 and water. If appreciably higher yields are obtainable, then the possibility must be considered that some less complete synthesis may take place. This would involve a change in the usual ratio of unity for the exchange of CO_2 and O_2. The behavior of the pressure change observed during the short periods of light and darkness used for measuring efficiency indicated that there

are large variations in the ratio of exchange of O_2 and CO_2. Since the computation of photosynthesis from measurements of pressure change is based on the assumed constancy of this ratio, it is concluded that the efficiencies obtained from the usual manometric measurements are subject to certain errors and may not represent the true efficiency of the assimilatory apparatus.

Ultra-violet spectrophotometry of Zea mays pollen with the quartz microscope, F. M. Uber. (Univ. Mo.). (*Amer. Jour. Bot., 26 (1939), No. 10, pp. 799–807, figs 9*).—Theoretical considerations concerned in measuring absorption spectra with the microscope are discussed, and photoelectric, Geiger-Mueller counter, and photographic methods of ultraviolet spectrophotometry with the microscope are described, the last employing step-weakeners of platinum on quartz as a basis for density determinations. Walls of maize pollen grains of varying genetic constitution were found to have similar transmission curves, characteristic features being a broad minimum centering around 2,900 a. u., a maximum at 2,500 a. u., and some variation among pollen varieties in the region of 3,200–3,600 a. u. A single wall transmitted 15–20 percent at 2,900 a. u. The contents of pollen grains were characterized by a minimum in transmission around 2,600 a. u., a maximum at 2,500 a. u., and a fairly low but rather constant transmission at 3,000–3,600 a. u. An 8μ layer of pollen contents transmitted 19–23 percent at 2,650 a. u. Only a limited correlation of maize pollen spectra with chemical constitution is possible at present due to a lack of adequate chemical analysis and essential absorption data for the individual components present.

Plant material introduced by the Division of Plant Exploration and Introduction, Bureau of Plant Industry, April 1 to June 30, 1935 (*U. S. Dept. Agr., Inventory 123 (1940), pp. 63*).—This number lists 1,660 lots of plant material, with descriptive notes in many cases.

Flowering shrubs of California and their value to the gardener, L. Rowntree (*Stanford University, Calif.: Stanford Univ. Press; London: Oxford Univ. Press, [1939], pp. XII+317, [pl. 1, figs. 56]*).—This semipopular book is based "on work and observation out of doors among California's native flora, all up and down the State." The approach is "from the gardener's, not the scientist's, standpoint," in the hope that it "will bridge the too-wide gap between botanical manuals and books on gardening."

Two new North American species of Vitis, J. L. Fennell. (U. S. D. A.). (*Jour. Wash. Acad. Sci., 30 (1940), No. 1, pp. 15–19, figs. 2*).—*V. gigas* n. sp. (Florida blue grape) and *V. popenoei* n. sp. (South Mexican muscadine grape) are described and illustrated.

[Abstracts of bacteriological papers] (*Jour. Bact., 39 (1940), No. 1, pp. 6, 7, 10, 11, 14, 17, 20, 21, 23, 38, 39, 49, 50, 84–86, 87, 91–93, 95, 96, 97–100, 101, 102, 107, 111, 112*).—The following are of interest to agricultural botany: A Quantitative Method for Testing the Bactericidal Efficiency of Volatile Compounds, by M. J. Foter and E. R. Kline (Univ. Conn.); The Preservation of Bacteria in Vacuo, by J. H. Brown; The Effect of Certain Cultural Procedures on the Rate of Lactose Utilization by Slow Lactose-Fermenting Bacteria, by J. O. Mundt and E. R. Hitchner (Univ. Maine); The Inhibiting Effect of Acetic Acid With Sodium Chloride and Sucrose on Microörganisms, by A. S. Levine and C. R. Fellers (Mass. Expt. Sta.); The Inactivity of Colchicine for Bacteria, by M. W. Jennison; The Relation of H-ion Concentration to Pigmentation of Actinomycetes, by J. E. and H. J. Conn (N. Y. State Sta.); Factors Influencing Microbial Thermogenesis, by S. E. Wedberg and L. F. Rettger; Host Ranges of Plant-Disease Viruses, by F. O. Holmes; Normal-Tobacco-Plant Protein and Tobacco-Mosaic-Virus Protein as Anaphylactogens and Precipitinogens in the Guinea Pig, by H. P. Beale and B. C. Seegal; Properties of Bactericidal Fractions Extracted From a Sporulating Soil Bacillus, by R. J. Dubos and R. D.

Hotchkiss; Microbial Fermentation, by L. F. Rettger; The Biochemical Classification of Strains of Yeast, by A. S. Schultz, L. Atkin, and C. N. Frey; The Influence of the Initial pH of Rye Mashes on the Fermentation Efficiency, by H. F. Willkie, P. J. Kolachov, and W. H. Stark; The Fermentation of Cigar-Leaf Tobacco, by J. J. Reid (Pa. Sta.); A Study of Thirty Monotrichic Strains of *Pseudomonas*, by R. G. Harris (Pa. State Col.); A Study of Fifty Lophotrichic Strains of *Pseudomonas* and *Phytomonas*, by J. Naghski, M. A. Farrell, and J. J. Reid (Pa. Sta.); The Influence of Hydrogen-ion Concentration Upon the Growth of *Propionibacterium*, by R. P. Tittsler (U. S. D. A.); The Bacteriophage of *Rhizobium* spp., by H. Katznelson (Cornell Univ.); Dissociation and Bacteriophagy of *Bacillus mycoides* and *Bacillus cereus*, by R. E. Gordon (U. S. D. A.); A Division of the Alfalfa Cross-Inoculation Group Correlating Efficiency in Nitrogen Fixation With Source of *Rhizobium meliloti*, by J. C. Burton and L. W. Erdman; The Stimulating Effect of Colloids Upon the Growth of Certain Bacteria, by H. J. and J. E. Conn (N. Y. State Sta.); Antagonistic Action of an Aerobic Spore-Forming Bacillus on Fungi, Actinomycetes, and Bacteria, by H. Katznelson (Cornell Univ.); Onion Juice and Bacterial Growth, by J. E. Fuller and E. R. Higgins (Mass. State Col.); A Simple Apparatus for Studying Microbial Thermogenesis, by S. E. Wedberg; and A New Species of the Lost Genus *Asporomyces*, by E. M. Mrak (Univ. Calif.).

A procedure for staining filamentous algae and fungi on the slide, J. E. Adams. (Univ. N. C.). (*Stain Technol., 15 (1940), No. 1, pp. 15, 16*).—The procedure described and successfully used in overcoming previous difficulties is a modification of the A. W. Haupt[3] gelatin fixative.

Progress in the standardization of stains: Biological stains in time of war, H. J. Conn (*Stain Technol., 15 (1940), No. 1, pp. 1, 2*).

The use of Sudan black B as a bacterial fat stain, T. L. Hartman (*Stain Technol., 15 (1940), No. 1, pp. 23–28, figs. 4*).—Saturated solutions of this stain in 70 percent alcohol or in ethylene glycol stained the fat bodies of bacteria a deep blue-black color. The method was to suspend a loopful of the cells in a drop of the stain solution and to prepare flat wet mounts. Various bacteria and fungi were successfully stained.

GENETICS

[Plant genetics research] (*Genetics, 25 (1940), No. 1, pp. 109, 110, 113, 114, 116, 117, 118, 119, 121, 122, 125, 126, 129, 132–134, 135, 136, 137, 138, 140*).—Papers presented at the 1939 meetings of the Genetics Society of America, published in abstract form, include Cytogenetics of Incompatibility in *Trifolium repens*, by S. S. Atwood (p. 109), Tetrasomic Inheritance in *Dactylis glomerata*, by W. M. Myers (p. 126), and The Association and Behavior of Chromosomes in Autotetraploid Grasses, by W. M. Myers and H. D. Hill (p. 129) (all U. S. D. A.); Mitosis in the Pollen Tube of *Eschscholtzia*, by A. V. Beatty (p. 110); The Significance of Double Fertilization in Flowering Plants (p. 113) and Somatoplastic Sterility as a Cause of Seed Failure Following Interspecific Hybridization (p. 114), both by R. A. Brink and D. C. Cooper (both Univ. Wis.); Effects of Colchicine Upon the Nuclear and Cytoplasmic Phases of Cell Division in the Pollen Tube, by O. J. Eigsti (pp. 116, 117); Spontaneous Chromosome Aberrations in *Tradescantia*, by N. Giles (p. 117); The Structural Significance of Reproduction Capacity in Self-Reproducing Entities, by J. W. Gowen (pp. 118, 119), and Top-Root Ratios of Inbred and Hybrid Maize, by D. B. Shank (p. 134) (both Iowa State Col.); A Preliminary Report of the Effects of In-

[3] Stain Technol., 5 (1930), No. 3, pp. 97, 98.

breeding in Cotton, With Special Reference to Staple Length and Lint Percentage, by L. M. Humphrey (pp. 121, 122) (Univ. Ark.); Production and Rate of Mutation in *Phytomonas stewartii* by X-Radiation, by R. E. Lincoln (pp. 125, 126) (Iowa State Col. and Cornell Univ.); A Cytologically Deficient Speltoid of Hybrid Origin, by R. M. Love (p. 126); X-Ray Induced Chromosome Deletions in Relation to Mutation Rate in *Tradescantia*, by C. M. Rick (p. 132); The Genetics of Certain Leaf Variations in *Coleus blumei*, by D. C. Rife and C. D. Boye (pp. 132, 133) (Ohio State Univ.); Interaction of Genes for Flower Color in *Nemesia strumosa*, by H. P. Riley (p. 133); Morphological Differentiation in Chromosomes of *Datura stramonium*, by S. Satina and A. F. Blakeslee (pp. 133, 134); Monofactorially Conditioned Inviability of an Intergeneric Hybrid in the *Triticinae*, by E. R. Sears (p. 134) (U. S. D. A. and Univ. Mo.); The Gene Mutations of *Oenothera lamarckiana* and Its Mutational Derivatives, by G. H. Shull (p. 135); The Developmental Basis of Inherited Size Differences in Plant Organs, by E. W. Sinnott and W. G. Whaley (p. 136); Frequency of Quadrivalent Formation in *Tradescantia* Tetraploids, by G. Skirm (pp. 136, 137); Heterozygous Inversions in *Tradescantia*, by C. P. Swanson (p. 138); Changes in Chromosome Sensitivity to X-Rays, by G. B. Wilson and B. R. Nebel (p. 140) (N. Y. State Expt. Sta.); and Inheritance of Form of Flower in *Linaria vulgaris* Hill, by G. Wright (p. 140).

Cytological and developmental studies of hybrids between Medicago sativa and a diploid form of M. falcata, G. F. LEDINGHAM. (Wis. Expt. Sta.). (*Genetics, 25 (1940), No. 1, pp. 1-15, figs. 30*).—Two triploid hybrids derived from *M. sativa* ♀ (n=16) × *M. falcata* ♂ (n=8) were highly variable, but the flower and pod characters and the chromosome number tend to be close to those of the recurrent parent. Usually 8 bivalents and 8 univalents were present at first metaphase, but some female gametes were viable in outcrosses to the parental types. In a few tetraploid hybrids obtained from *M. falcata* × *M. sativa*, the flower color and pod shape were closer to the *falcata* type than in the triploid hybrids, for in the tetraploids twice the usual inheritance of the diploid *M. falcata* was received. The fertility of the tetraploid hybrids was high, 16 bivalents usually forming, and the next generation was highly variable. Homologous chromosomes of *M. falcata* and *M. sativa* interpair freely, and there is no criterion by which the forms can be separated into distinct species. The diploid form of *M. falcata* does not cross readily with *M. sativa* due to faulty development after fertilization. Development following reciprocal crossing is described briefly.

The sterility of Sparks aconite, W. J. BONISTEEL (*Bul. Torrey Bot. Club, 67 (1940), No. 2, pp. 93-116, pls. 4, figs. 5*).—The aconite horticulturally known as the Sparks variety has hitherto been propagated exclusively as a clone, since its introduction (1898) no record having been found of any member producing seed. Tests indicated that the plants of this clone are unable to produce seed with any kind of pollination, and only 0.5 percent of the pollen germinated. The cytological abnormalities leading to this sterility are described. It is deemed certain that this aconite is a triploid, with a somatic number of 24 chromosomes, which are to be resolved in 3 sets. The plant is evidently a hybrid.

Animal breeding, A. L. HAGEDOORN (*London: Crosby Lockwood & Son, 1939, pp. 304, figs. 29*).—This book, taking full account of advances made in the science of animal genetics, is prepared for the practical breeder and recommends genotypic, as contrasted with phenotypic, selection of breeding animals.

On a method for testing for linkage between lethal genes, W. E. CASTLE (Univ. Calif.). (*Natl. Acad. Sci. Proc., 25 (1939), No. 12, pp. 593, 594*).—Linkage between lethal genes may be determined by first crossing strains

carrying both lethals. F_1 progeny heterozygous for both lethals should be mated with a strain not carrying either lethal. Four classes of progeny carrying neither, both, or one of the other lethal factors will be produced if there is no linkage. If linkage exists, carriers of both or neither lethal condition will be more abundant than carriers of either one or the other. Wobbly and anemia, two lethals in mice, were found by this method to be independently inherited. Anemia was linked with curly, but wobbly was independent, suggesting no linkage between these conditions.

[**Experiments on the breeding and reproduction of livestock and poultry by the Bureau of Animal Industry**]. (Partly coop. Mont., Mo., Fla., Tex., and Ga. Coastal Plain Expt. Stas.). (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt., 1939, pp. 8, 14–16, 21–24, 26, 27–29, 32, 33, 35–37*).—Brief results are given on the progress of investigations on the breeding of various animals dealing with the following: Inbreeding and cross-breeding studies with guinea pigs and dogs; record-of-performance studies on beef Shorthorn, Milking Shorthorn, Aberdeen Angus, Brahman × Angus, Hereford, Red Polled, and Red Danish × Red Polled breeds and crosses at Beltsville, Md., Miles City, Mont., Jeanerette, La., Brooksville, Fla., Tifton, Ga., Grain Valley, Mo., and Middlebury, Vt.; inbreeding and cross-breeding for the production of strains of sheep with increased productive qualities at Dubois, Idaho; artificial insemination of sheep at Beltsville and Dubois; Karakul sheep breeding at Beltsville; physiology of reproduction and breeding for improved strains in sheep at Beltsville, Fort Wingate, N. Mex., and Quincy, Fla.; inheritance of skin folds in Rambouillet sheep at Sonora, Tex.; progeny testing at Dubois; inheritance of hermaphroditism in milk goats at Beltsville; the development of superior strains of purebred and crossbred Chester White, Danish Landrace, Danish Yorkshire, Duroc-Jersey, Large Black, and Poland China swine at Beltsville, Miles City, and Tifton; physiology of reproduction in mares and stallions at Miles City and Columbia, Mo.; the production of superior strains of Morgan horses at Middlebury; poultry breeding; and improvement of White Leghorn strains for production and superior egg quality, purebred and crossbred strains of poultry, including sex identification at hatching, and the artificial insemination of turkeys, all at Beltsville.

[**Effects of breeding methods on livestock at the Iowa Station**], J. L. Lush, C. Y. Cannon, E. N. Hansen, P. S. Shearer, C. C. Culbertson, N. F. Waters, E. W. Lindstrom, and J. W. Gowen (*Iowa Sta. Rpt. 1939, pt. 1, pp. 79–81, 94, 95, fig. 1*).—Brief results are given on the progress of investigations relating to inbreeding of Holstein-Friesian cattle closed to outside blood; inbreeding Poland China hogs in four-, two-, and one-sire herds; the amounts of inbreeding of pure breeds of livestock; and the effect of inbreeding and cross-breeding domestic fowls on fertility, hatchability, viability, days to first egg, egg production, egg weight, and body size of the progeny.

[**Investigations on animal genetics and the physiology of reproduction**] (*[New York] Cornell Sta. Rpt. 1939, pp. 113, 116, 167–170*).—Results of the following experiments are briefly reported: The use of hormones for combating sterility in cattle, by S. A. Asdell, S. E. Smith, and M. G. Fincher; artificial insemination in dairy cattle, by G. W. Salisbury, Asdell, E. L. Willett, E. S. Harrison, E. S. Savage, J. P. Willman, and I. C. Gunsalus; genetic studies of the resistance of White Leghorns to disease (noted on page 757), by F. B. Hutt and J. H. Bruckner; inheritance of interior egg quality, by G. O. Hall; selection for reduced embryonic mortality and high egg production in White Wyandottes, by Bruckner and Hutt; inheritance of eggshell color in White Leghorn and Rhode Island Red crosses, by Hall; a study of the genetics of several specific characters in fowls, by Hutt and Bruckner; the physiology of

avian reproduction, by W. F. Lamoreux and Hutt; and the effects of preferential mating, intensity of egg production, and spermotoxins on the fertility in the fowl, by Lamoreux.

Law of increase in sire evaluation reliability with increase in offspring number, W. E. ALTSCHULER (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 24 (1939), No. 4, pp. 360–363*).—The greater reliability of the records of increased numbers of calves as an indication of the reproductive capacity of sires by Wright's formula [4] is taken as the basis for changes in the values of *X*.

Notes on the history of the Scottish Mountain Blackface sheep and some genetical observations on certain breed characteristics, I. W. PARNELL (*Sci. Agr., 20 (1939), No. 4, pp. 205–233, figs. 12*).—The early history of Black-faced Highland sheep leads to the belief that individuals of this breed have been firmly established in England for several centuries. The fleece consists of wool, long hair fibers, and kemp. Differences in environmental influences are thought to be, in part, responsible for variations in the wool quality, although the importance of heredity in determining the various wool types cannot be minimized. The hardiness of the breed has been transferred to other breeds through crossing, with varying results. Face colors in Black-faced sheep seem to depend on two or more pairs of genes acting in a quantitative manner, and a correlation was found between the face color of ewes and that of their lambs. Only light-faced rams were used. A correlation of the body spotting with face color proved positive in 2,156 lambs produced by about 60 rams. Based on the weights of their lambs as an indication of the milking capacity of the ewes, no relation was found between milking capacity and color of the ewes, and the hardiness of the lambs and fertility of matings with the amount of black or white in the faces of the rams.

Speed and blood value of English race-horses, V. I. PATRUSHEV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 23 (1939), No. 7, pp. 714–717, fig. 1*).—Studies of 2- and 3-year-old mares and colts showed that those which were classified as faster had a higher concentration of red cells, glutathione, and blood sugar and a lower index of breathing, pulse, and sedimentation of erythrocytes than those classified as slower in racing. In a group of the fastest horses, "stayers" showed a slight tendency to increase the content of total and oxidized glutathione, as compared with "fliers" (speed-lacking persistence). Measurements of the chemical changes just before, during, and after racing suggested a relation of red cell concentration to speed and in stayers a higher concentration and least change in the fastest horses after a race.

Fertile mare mules, W. S. ANDERSON. (Univ. Ky.). (*Jour. Hered., 30 (1939), No. 12, pp. 549–551, fig. 1*).—The explanation of mare mules' occasionally producing colts is based on the rare segregation of all horse chromosomes in an ovum. Such ova are fertile, and the zygote from mating with a stallion shows horse characteristics. The high fetal mortality rate in mare mules which foaled is explained as due to the partial viability of the combination of chromosomes formed.

A fertile mule from Arizona, H. H. SMITH. (Utah State Col.). (*Jour. Hered., 30 (1939), No. 12, p. 548, fig. 1*).—A mule and her foal, sired by a jack, are discussed.

Lethality and abnormal condition of the pelage of the Latvian mouse (dominant-naked), W. J. P. R. VAN EBBENHORST TENGBERGEN (*Genetica ['s Gravenhage], 21 (1939), No. 5–6, pp. 369–385, figs. 2*).—The mortality and condition of the fur of the young were related to the genotype of the parents and grandparents, indicating the importance of genetic influences on the mortality.

[4] Amer. Soc. Anim. Prod. Proc., 24 (1931), pp. 71–78.

Significant differences in the lethality with the age when the young die were related to the nature of the mother, who was also influenced by the nature of her parents. Detrimental influences on the milk produced by homozygous naked ♀♀ on the pelage of foster heterozygous and homozygous young were very apparent. Under the most favorable conditions, including normal foster mothers, the lethality of homozygous naked young was over 40 percent. At the same time, normal young could be raised on milk from heterozygous dams.

Heritable differences in conformation of adult female fowl, R. G. JAAP and R. B. THOMPSON. (Okla. Expt. Sta.). (*Poultry Sci., 19 (1940), No. 1, pp. 73–78*).—Study was made of the relation of body weight to shank and keel length and body depth in 1,487 ♀♀ of the Buff Orpington, White Plymouth Rock, Barred Plymouth Rock, Single Comb Rhode Island Red, and Single Comb White Leghorn breeds, and an addition in the second year of White Wyandottes. The White Leghorns had proportionately longer shanks and deeper anterior body depth than the 5 other breeds studied. There was a definite improvement in conformation in the second year due, presumably, to parent selection. Differences in the conformation of sister groups were also noted. Because of the hereditary nature of such differences as were observed in the ♀♀, selection on this basis is suggested for increasing the uniformity of conformation in the meat quality of birds from laying tests.

Studies on the lethal mutation of Cornish fowl: Growth in length of long bones and increase in weight of the body and of some organs, W. LANDAUER ([*Connecticut*] *Storrs Sta. Bul. 233 (1939), pp. 45, figs. 14*).—Body weights and growth of the long bones and some organs of lethal embryos in inter se matings of Cornish × Leghorn fowls (E. S. R., 75, p. 468) show that body weights are normal, but that the length of the long bones is reduced beginning in early stages, the extent of the reduction being in part related to the location. Charts are presented to show the comparative measurements of body and organ weight and length of long bones of lethal Cornish and creeper embryos. Studies of related sizes show that the Cornish lethal embryos attempt some compensatory hypertrophy resulting from the deficiency in blood-forming tissues.

Studies on the creeper fowl.—XII, Size of body, organs, and long bones of late homozygous creeper embryos, W. LANDAUER ([*Connecticut*] *Storrs Sta. Bul. 232 (1939), pp. 62, figs. 14*).—The relative and absolute weights of the body, organs, and measurements of the long bones of normal, heterozygous, and homozygous creeper embryos from the ninth to the eighteenth day of incubation are presented in detail in continuation of this series (E. S. R., 78, p. 771). The results show that body weights, long bone measurements, and weight of eyes, liver, and gizzard are, in the main, drastically reduced in the homozygous creepers, but heterozygous creepers approach the normal to a varying extent. The heart and spleen weight in homozygous creepers increased, presumably as a result of compensation to anemic symptoms, which developed during the second week of incubation.

Breeding strains of poultry resistant to fowl paralysis, F. B. HUTT. (Cornell Univ.). (*U. S. Egg and Poultry Mag., 46 (1940), No. 1, pp. 47–50*).—Differences in the adult mortality of susceptible and resistant strains of Single Comb White Leghorns for two generations showed that 36 percent of the birds in the susceptible line, as contrasted with 19 percent in the resistant line, succumbed to neoplasms. Data on the third generation also indicate that resistant and susceptible strains may be isolated by progeny testing.

A light mutant of the mallard duck, I. R. HUNTER (*Jour. Hered., 30 (1939), No. 12, pp. 546–548, fig. 1*).—Inbreeding of mallard ducks hatched from eggs taken from the wild produced, in 1933, two hens which were almost entirely

white on the breast, with light wings and tail and a slightly gray head. These and similar ducks subsequently produced were disposed of, but in 1937 light mallards again were produced. High mortality in inter se matings and matings with Indian Runners suggested that the light ducks carried a lethal or semilethal gene.

Behavior of genes in intergeneric crosses: Effects of two dominant genes on color in pheasant hybrids, C. H. Danforth and G. Sandnes (*Jour. Hered., 30 (1939), No. 12, pp. 537–542, figs. 3*).—Studies of the action of the *W* gene for dominant white in a pheasant × domestic fowl, and the *M* gene for the mutant pattern in the pheasant in interpheasant species crosses showed that these genes generally behaved essentially the same as under normal conditions, even though they were brought into association with foreign genomes in a foreign cytoplasm. Partial fertility of some of the hybrids was noted. Certain of the hybrids were so different as to be classed as a separate species, at least on first consideration. There is, however, a question if such hybrids are produced in nature.

Iris pigmentation in domestic pigeons, W. F. Hollander and R. D. Owen. (Wis. Expt. Sta.). (*Genetica ['s Gravenhage], 21 (1939), No. 5–6, pp. 408–419*).—An analysis of the iris color records in the pigeon colony revealed an autosomal recessive factor *tr* responsible for pearl, as contrasted with the normal orange of the wild type. A similar color was found to be frequently associated with the chocolate plumage, but it had a faint yellow tint. No evidence was detected from the records for the linkage of *tr* with the plumage color factors *S*, *C*, or *o*. Chemical tests were also reported on the iris pigment.

The mammogenic hormones of the anterior pituitary.—I, The duct growth factor, A. A. Lewis and C. W. Turner (*Missouri Sta. Res. Bul. 310 (1939), pp. 72, figs. 18*).—Assay of the pituitaries of 545 cattle for their content of the duct growth factor of the mammary gland was performed by stimulation in the growth of mammary glands of ♂ mice weighing from 15 to 25 gm. as a result of 6 daily subcutaneous injections of pituitary tissue from animals to be tested. It was found that the mammogen content of cattle was low in early and late pregnancy, rising to a peak at about 150 days of gestation. Greater amounts of hormone were found in the dairy cow pituitaries than in the pituitaries from beef cows in both pregnant and nonpregnant animals. The differences were from 16 to 56 percent per gram of tissue and from 11 to 152 percent per anterior lobe. Nonpregnant cows showed appreciable amounts of mammogen in their pituitaries, but the largest amounts were found in lactating dairy cows. Pregnant beef heifers had from 40 to 60 percent more mammogen per lobe than pregnant beef cows, but the mammogen content of beef heifers with only follicles in the ovaries was low. The content of mammogen in the pituitaries of beef and dairy steers, bulls, and fetuses is discussed. Separation of mammogen from other pituitary hormones was effected. Mammogen differed from oestrogen in being heat labile and subject to oxidation.

Duct development was also induced in hypophysectomized ground squirrels. An extensive bibliography is appended.

Glutathione values of livers and muscles of rabbits after injection of hypophyseal growth hormone, P. W. Gregory and H. Goss. (Univ. Calif.). (*Growth, 3 (1939), No. 2, pp. 159–164*).—Analyses are reported of the glutathione and ascorbic acid content of samples of the liver and muscles from rabbits of different breeds, ages, and sizes but paired for known influences, such as injections of heated and unheated extracts of growth hormone from the pituitary administered 12 hr. before killing. The glutathione content of both liver and muscle were significantly lowered by the injection of potent sources of the growth hormone, as in cases of the rat (E. S. R., 74, p. 624). It ap-

peared that the glutathione concentration may be taken as an index of anabolic activity.

Lactogen content of pituitary of pregnant and lactating rabbits and guinea pigs, S. Holst and C. W. Turner. (Mo. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc., 42 (1939), No. 2, pp. 479–482*).—Continuing studies of the lactogen content of the pituitaries of different species (E. S. R., 81, p. 637), comparison was made of the lactogen content of the pituitaries of rabbits and guinea pigs at different stages of pregnancy and lactation. These results showed that the lactogen content of the pituitaries increased little until the last portion of the gestation and when parturition was approached. Both animals reached a peak shortly after parturition, but the rise in the rabbit pituitary was more pronounced. Absence of nursing resulted in an increased lactogen content of the pituitaries.

Assay of progesterone by intrauterine application in the rabbit, A. L. Haskins, Jr. (*Soc. Expt. Biol. and Med. Proc., 42 (1939), No. 2, pp. 624–628*).—Progesterone-injected segments of immature rabbit uteri, prepared for 6 days with amniotin, were found to give a positive reaction to 0.25 γ to 1,000 γ of progesterone applied to the uterus in all but 1 of 14 immature animals. Irregularity and lack of constancy from tests using lanolin as the solvent, and with mature instead of immature rabbits, did not give support to these tests. Positive results were obtained with as little as 0.2 cc. of pregnancy serum from guinea pigs. Since control segments in the uterus of treated animals showed no reaction, except with large doses, it was evident that local application was effective and superior to intramuscular injections.

Effect of local application of progesterone on the rabbit uterus, D. A. McGinty, L. P. Anderson, and N. B. McCullough (*Endocrinology, 24 (1939), No. 6, pp. 829–832*).—Similar to the above findings, single doses of from 0.5γ to 5γ of crystalline progesterone in peanut oil or lanolin introduced into isolated loops of the uterus of immature rabbits treated previously by theelin produced progestational proliferation similar to that of intramuscular injections over a 5-day period.

Testis hormone secretion in the rat under conditions of vasectomy or isolation, H. Poynter (*Anat. Rec., 74 (1939), No. 3, pp. 355–379*).—Vasectomy in 117 ♂ rats ranging in age from 15 days to 15 mo. failed to cause degeneration of the germinal epithelium or hypertrophy of the interstitial cells of the testes. Neither this operation nor the isolation of the ♂♂ prevented normal development of the sex accessories, suggesting normal testis hormone secretion.

Hypospadias and non-descent of the testes caused in rats by progesterone, H. Burrows (*Nature [London], 143 (1939), No. 3629, p. 858*).—A note is given on the occurrence of hypospadias in ♀♀ and failure or delay in the testes' descent in mice and rats treated from birth with progesterone, oestrogens, or androgens in sesame oil.

Effect of simultaneous administration of growth complex and estradiol on mammary gland of hypophysectomized rat, I. T. Nathanson, D. T. Shaw, and C. C. Franseen (*Soc. Expt. Biol. and Med. Proc., 42 (1939), No. 2, pp. 652–655*).—Hypophysectomy of mature and immature ♂ and ♀ rats resulted in the usual atrophy of the mammary glands, which was not prevented by the daily administration of the growth complex. The daily administration of oestradiol benzoate to normal animals was accompanied by marked ductal and acinar proliferation in the mammary gland. A similar condition also accompanied hypophysectomy when the growth complex and oestradiol benzoate were administered, provided there was an increase in growth and weight of the animal. Nutrition of the animal seemed to be an important factor in the effects produced on

the mammary gland by oestradiol. There is evidence that oestrogen may inhibit the action of the growth hormone.

Effect of testosterone propionate on genital tract of adrenalectomized and ovariectomized immature female rats, I. T. Nathanson and R. W. Rawson (*Soc. Expt. Biol. and Med. Proc., 42 (1939), No. 2, pp. 482–484*).—The effects of testosterone propionate in inducing vaginal opening in immature ♀ rats (E. S. R., 82, p. 35) did not result from the change by the adrenal of testosterone into an oestrogenic hormone, since a similar result was obtained in adrenalectomized and ovariectomized rats. It is considered that the testosterone acts directly on the uterus and vagina and indirectly on the ovary, by way of the hypophysis, in operatively adrenal-insufficient animals.

Factors influencing ovarian response of normal and hypophysectomized rat to pregnant mare serum, R. I. Pencharz. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc., 42 (1939), No. 2, pp. 525–529*).—Results regarding the administration of Gonadin, a pregnant-mare serum extract, on the ovaries of immature ♀ rats showed that intraperitoneal administration was more effective than subcutaneous administration in both normal and hypophysectomized animals. The hormone was about twice as effective in the normal as in the hypophysectomized rat. Uterine responses were not sufficiently affected by the mode of injection, but in hypophysectomized animals intraperitoneal injection was 4 times as effective as subcutaneous administration. One dose was given for 12 days intraperitoneally. It was 3 times as effective as a subcutaneous dose in the normal animal, and 11 times as effective in hypophysectomized rats. When 24 units were distributed over a 4-day period, administration by subcutaneous methods proved equally as effective as intraperitoneal administration in both normal and hypophysectomized rats. The rate of absorption is suggested as an important factor in the result obtained.

Responses of hypophysectomized immature female rats to mare serum hormone, J. H. Leathem (*Soc. Expt. Biol. and Med. Proc., 42 (1939), No. 2, pp. 590–592*).—From study of the effect of varied doses of pregnant-mare serum on the overies of hypophysectomized immature ♀ rats, it was found that small doses tend to cause thecal luteinization, whereas large doses caused corpora lutea formation. Castrate urine gave different results, producing only follicle stimulation in the absence of thecal luteinization in ovaries weighing as much as 80 mg.

Maintenance of gestation in the castrate pregnant rat with androgens, R. R. Greene and M. W. Burrill (*Soc. Expt. Biol. and Med. Proc., 42 (1939), No. 2, pp. 585–587*).—In rats castrated before the eleventh day of gestation, resorption of the fetuses occurred in spite of the administration of androgens, but most of the ♀♀ castrated after the eleventh day of gestation carried their young to term. These results suggest that androgens may be, at least in part, substituted for the ovarian secretions during the latter half of gestation.

Divergent pathways in sexual development, W. R. Coe (*Science, 91 (1940), No. 2356, pp. 175–182*).—The author reviews the development and expression of sexuality in vertebrates and invertebrates, with special reference to Crepidula and factors influencing hormones and their predominance in sex expression of the higher forms, including their sites of production in the gonads as important factors.

Modified sexual photoperiodicity in cotton-tail rabbits, T. H. Bissonnette and A. G. Csech (*Biol. Bul., 77 (1939), No. 3, pp. 364–367*).—Three pairs of rabbits given additional electric light at night up to 8 hr. in winter were found to mate and make nests, but no pregnancies resulted until April. Sperm production followed 28 days of lighting in December and January.

Methods for producing autosexing varieties of chicks, R. G. JAAP. (Okla. Expt. Sta.). (*U. S. Egg and Poultry Mag., 46 (1940), No. 1, pp. 36–39, figs. 6*).—Autosexing at hatching is described, with special reference to the Legbar breed, produced in Europe, and the production of Oklabars by crossing White Plymouth Rocks and Rhode Island Reds. It is suggested that a silver-barred autosexing large variety might be produced by crossing with the Silver-Laced Wyandotte.

Sex identification of Jersey Black Giant, Jersey White Giant, and White Plymouth Rock chicks by down, shank, and beak color, J. P. QUINN and C. W. KNOX. (U. S. D. A.). (*Poultry Sci., 19 (1940), No. 1, pp. 79, 80*).—Continuing these studies (E. S. R., 82, p. 37), it was found that the pigmentation of the shank, beak, and ventral down in Jersey Black Giant, Jersey White Giant, and White Plymouth Rock chicks, although indicative of the sex at hatching, was not a reliable index for the separation of chicks of these breeds.

FIELD CROPS

[**Field crops research in the Bureau of Plant Industry**]. (Partly coop. State expt. stas.). (*U. S. Dept. Agr., Bur. Plant Indus. Rpt., 1939, pp. 3–9, 10, 11, 11–13, 20, 21, 33, 34, 35, 36, 37*).—Brief reports of progress and accomplishments are made from breeding work with corn, wheat, oats, barley, cotton, grain sorghum, hemp, sugarcane, and sugar beets; expansion of hybrid corn production; value of wheat pasture for overwintering cattle; adaptation of barley varieties as measured by natural selection; better ability of tropical rice varieties to withstand heat; northward extension of the sorghum region by early grain sorghums; establishment of fall-sown flaxseed industry in Texas; practical methods for bindweed control; association of cotton root rot resistance with chemical composition; inheritance of fuzz and lint characters in cotton; revival of interest in sea-island cotton; improvement of quality and increase of price of cotton by standardized production; determination of milo yield by water stored in soil; amount of the precipitation during fall, winter, and early spring as a guide to land preparation for grain sorghums; production practices for wheat in Oregon; variation of soybean composition with environment; superiority of legumes over nonlegumes as green manure; Korean lespedeza supplemental to permanent bluegrass pastures; lesser damage from field pea disease on fertile soil; composition of edible soybeans as affected by stage of maturity; response of clovers to phosphate; reduplication of chromosomes in perennial ryegrass, white clover, and red clover by colchicine treatment; seed production in the potato caused by regulation of light periods; handling of sweetpotatoes for starch manufacture; studies of sorgo and sugarcane-sorgo hybrids; sugar beet spacing studies as aids in mechanization problem; induction of polyploidy in *Nicotiana* species and hybrids by treatment with colchicine; flue-curing tobacco with oil, electricity, and coal; distinctive effects of copper deficiency on growth of tobacco; and benefits of improved crop rotations to irrigated potatoes.

Agronomic research projects, H. M. STEECE (*U. S. Dept. Agr., Off. Expt. Stas. [1939], pp. 5; also in Jour. Amer. Soc. Agron., 32 (1940), No. 2, pp. 135–140*).—The status of agronomic research on a project basis, particularly that in progress at the State agricultural experiment stations on Federal-grant funds, is reviewed briefly. The development of a project is discussed, with comments on the essential points to be covered in a research project outline, including title, objectives, reasons for the study, previous work and present outlook, procedure, duration, financial support, personnel, and cooperation.

[Agronomic research in Colorado]. (Partly coop. U. S. D. A., Univ. Minn., et al.). (*Colorado Sta. Rpt. 1939, pp. 9, 10, 12, 13, 17, 31, 32, 36, 37, 50–54*).—The investigations (E. S. R., 80, p. 756) reported in these pages included breeding work with corn (and hybrids) and barley; studies of factors responsible for hydrocyanic acid content of Sudan grass; new cereal varieties, including Lico barley; potato research, including breeding work, tests of seedlings and varieties for yield and scab resistance, fertilizer and date of planting tests, and seed certification; research on natural revegetation of native range involving different grazing methods, artificial revegetation with native and introduced grasses, irrigation and management practices to maintain and improve native hay meadows and sagebrush lands, and range resource surveys; and studies on control of bindweed, weeds in lawns, and other weeds by cultivation, burning, and by chlorates and other herbicides.

[Field crops research in Georgia]. (Partly coop. Fla. Expt. Sta. et al.). (*Georgia Sta. Rpt. 1939, pp. 15–17, 18, 19, 20, 26, 28, 29, 30, 33, 34–46, 61, 64–67, 86–89, 90, 91, figs. 5*).—Agronomic work continued (E. S. R., 80, p. 474) at the station and Mountain Substation and reported on briefly included breeding work with corn, wheat, oats, cotton, soybeans, and peanuts; variety tests with cotton, oats, soybeans, peanuts, and potatoes; cotton nutrition studies dealing with trace element needs and ammonium v. nitrate nitrogen; fertilizer experiments with cotton concerned with acid v. base-forming mixtures, nitrogen, phosphorus, and potassium carriers, response to trace elements at different pH levels, and different fillers and magnesium in mixed fertilizers; seed potato production in northern Georgia for Florida growers; planting and fertilizer tests (including boron and manganese) with potatoes; variety, seeding, and fertilizer tests with fiber and seed flax, with production costs; fertilizer (including trace elements) tests with peanuts; and pasture research on fertilizers and limestone for Bermuda grass sod production, phosphorus and limestone requirement of some clovers on Bermuda-lespedeza sod, sources of nitrogen and phosphorus for Bermuda grass-lespedeza pasture, and winter clovers, grasses, and mixtures on Bermuda sod.

[Farm crops research in Iowa], C. P. Wilsie, H. D. Hughes, W. H. Pierre, L. C. Burnett, J. B. Wentz, C. Y. Cannon, M. G. Weiss, J. L. Robinson, I. E. Melhus, A. L. Bakke, W. E. Loomis, C. S. Reddy, G. Semeniuk, R. H. Porter, A. T. Erwin, P. A. Minges, G. S. Shepherd, G. W. Snedecor, G. M. Cox, C. P. Winsor, A. E. Brandt, L. A. Richards, J. M. Aikman, and T. W. Schultz. (Partly coop. U. S. D. A.). (*Iowa Sta. Rpt. 1939, pt. 1, pp. 55–66, 68, 69, 70, 115, 116, 118, 119, 193–195, 196, 198, 199–201, 237, 238, 239, figs. 4*).—Reports of progress (E. S. R., 81, p. 33) are made again on breeding work with oats, barley, wheat, soybeans, sweetclover, red clover, bromegrass, bluegrass, potatoes, and sweetpotatoes; variety tests with oats, wheat, barley, flax, red clover strains, sweetclover, soybeans, potatoes, and sweetpotatoes; adaptation studies with Mukden and Kanro soybeans, Ioglos barley, and Korean lespedeza; cultural studies with flax, reed canary grass, barley varieties, and with alfalfa varieties on bacterial wilt-infected soil; effect of cutting red and alsike clovers at different times; trials of legumes for green manure for corn and oats; relative value of red clover, alfalfa, and sweetclover as soil-building crops; fertilizer and varietal factors affecting storage quality and fertilizer and propagation tests with sweetpotatoes; permanent pasture improvement; effects of fertilizers and grazing methods on soil conditions and plant growth on permanent pastures; properties and herbicidal action of sodium chlorate mixtures; studies of survival of seed of bindweed and other weeds buried in soil, effect of temperature on the germination of normal seeds of *Amaranthus* spp., and on germination of dodder seeds on the basis of visual selection; statistical investigations of

experiment station data, including results of soybean field germination tests, a triple lattice field arrangement, and two quasi-factorial field arrangements for soybean plats; interrelations among meteorological environment, soil condition, growth response, and yield of crops; and a preliminary investigation of possibilities of estimating and forecasting wheat yields by an objective method of sampling the commercial crop.

[**Field crops research in Maryland**] (*Maryland Sta. Rpt. 1939, pp. 21, 22, 23–25, 26, 27, 28, 69, 73, figs. 2*).—Accomplishments are reported from agronomic investigations (E. S. R., 80, p. 757), including breeding work with corn and sweetpotatoes; genetic studies with corn; variety tests with corn and hybrids, wheat, barley, grain sorghum, potatoes, soybeans, and red clover; seed treatment with barley for loose smut; fertilizer trials with early and late potatoes and sweetpotatoes; a rotation pasture experiment; effects of fertilizer on fertility and grass population of pastures; and the plant production value of different samples of forage crop seed.

[**Field crops work in Mississippi**] (*Miss. Farm Res.* [*Mississippi Sta.*], *3* (*1940*), *No. 1, pp. 1, 2, 3, 4–7*).—Progress results from research with farm crops are reviewed in Prevention Easier Than Cure—Watch Wild Onions, Garlic, by E. B. Ferris (pp. 1, 2); Cotton Varieties in Hill Section of Mississippi (pp. 3, 4) and Tests of Corn Varieties, Hybrids, Hill Section (p. 6), both by J. F. O'Kelly; Bunch Velvet Beans [and] Forage Crotalaria, Medium Producers, by H. W. Bennett (p. 4); Soil Fertility Experiments, East Delta Area (p. 5) and Soil Fertility Experiments With Cotton—Atkinson Field in the South East Yazoo-Mississippi Delta (p. 6), both by R. Kuykendall; and Cotton Varieties in the Yazoo Mississippi Delta, by H. A. York (p. 7).

[**Field crops and plant improvement research in New York**], J. A. Bizzell, E. W. Leland, J. K. Wilson, D. B. Johnstone-Wallace, L. F. Randolph, J. R. Livermore, R. G. Wiggans, H. H. Love, W. T. Craig, F. P. Bussell, C. H. Myers, O. Smith, F. M. Blodgett, G. F. MacLeod, J. H. Barron, E. N. McCubbin, C. S. Tuthill, K. B. Nash, and G. E. Davis. (Partly Coop. U. S. D. A.). ([*New York*] *Cornell Sta. Rpt. 1939, pp. 104, 105, 122, 123, 144, 145, 146, 147, 185, 186*).—Results are reported briefly from breeding work and genetic studies with corn, wheat, oats, and barley; breeding experiments with timothy, alfalfa, soybeans, and potatoes; studies on tetraploid corn and the origin and nature of diploids produced by tetraploid corn, and the production of tetraploid strains of teosinte, Sudan grass, barley, iris, and other plants; experiments on the protein content of alfalfa cut at successive growth stages; legume inoculants; grasses, grass associations, and legumes for pasture purposes; adaptation of foreign and domestic varieties and strains of red and alsike clovers to New York; potato rotation studies; and green manures and cover crops in the potato rotation.

Approved methods of applying fertilizers to crops grown in the Coastal Plain section of North Carolina, E. R. Collins and H. D. Morris (*North Carolina Sta. Agron. Inform. Cir. 122* (*1940*), *pp.* [*1*]+*6*).—Placements are indicated for fertilizer used for cotton, corn, potatoes, sweetpotatoes, small grains, and other crops; and the yields and stands of cotton and corn and potato yields with variously placed fertilizers are tabulated.

Some practical findings from fertilizer experiments in North Carolina with different crops, C. B. Williams. (Coop. U. S. D. A.). (*North Carolina Sta. Agron. Inform. Cir. 121* (*1940*), *pp.* [*1*]+*21*).—Tables show the yields, values, costs, and net returns resulting from experiments including rates of applying complete fertilizer, fertilizer combinations, and lime on different soils for cotton, corn, wheat, peanuts, potatoes, sweetpotatoes, red clover, and soybeans; concentrated v. ordinary fertilizer for sweetpotatoes; rates of nitrogen for

potatoes and nitrogen carriers for potatoes and sweetpotatoes; and potassium carriers for potatoes and potassium rates for potatoes and sweetpotatoes.

Important grasses and other common plants on Montana ranges: Description, distribution, and relative value, L. P. Reitz and H. E. Morris. (Coop. U. S. D. A.). (*Montana Sta. Bul. 375 (1939), pp. 35, figs. 18*).—Important desirable range grasses described, with comments on distribution, range, and palatability value, include blue grama; western, thickspike, slender, bluebunch, and crested wheatgrass; bluegrasses; junegrass; Idaho fescue; needle-and-thread; timothy; buffalo grass; smooth brome; mountain brome; and Indian ricegrass. Downy chess, saltgrass, giant wild-rye, Canada wild-rye, little bluestem, and red three-awn are considered as low value range grasses. The merits of nongrass range vegetation also are commented on. Range grasses are grouped according to regions, and vegetation as affected by environment is discussed. An index to common and scientific names of species is appended.

The effect of shade on pasture, L. R. Neel (*Tennessee Sta. Cir. 65 (1939), pp. 2*).—Trees set in 1926 in bluegrass-clover pasture at the Middle Tennessee Substation and pruned several times to admit sunlight to the bases of the trunks definitely affected carrying capacity and botanical composition of the pasture areas. Respective steer days and gain per acre, 1934–39, averaged for locust plats 157 days and 189 lb., walnut 188 days and 260 lb., and unshaded plats 157 days and 214 lb. The percentage of bluegrass gained on all plats but faster on shaded areas, especially the locust plat, while lespedeza persisted best on unshaded pasture.

Alfalfa experiments at Stoneville, Miss., 1935–37, P. R. Henson and H. L. Westover. (Coop. Miss. Expt. Sta.). (*U. S. Dept. Agr., Tech. Bul. 701 (1939), pp. 24, figs. 9*).—Additional experiments (E. S. R., 74, p. 627) confirmed previous conclusions that poor surface drainage, use of unadapted seed, poor seedbed preparation, improper dates of seeding, failure to cut at the proper growth stage, and insects (for which control measures are given) and disease are all factors in alfalfa failures.

Well-drained Sharkey clay or buckshot soils, if not too acid, are well adapted to alfalfa, while the older soils of the Yazoo series and the better-drained phases of Sharkey clay in the eastern part of the Mississippi Delta are usually acid and require liming. Lack of surface drainage, responsible for most failures in growing alfalfa, has been remedied by building the field up into lands with surface ditches spaced at regular intervals. The grader was found slightly more economical than other implements in this operation, but better work could be done with the tailboard scraper-leveler. On fertile soils soybeans for hay has been a satisfactory crop to precede fall-sown alfalfa, but on less fertile soils it is advisable to turn the soybeans under in late July or early August as a green manure. Fertilizers were not economical, and cultivation increased neither yield nor quality. On certain soils lack of inoculation seemed responsible for slow and unsatisfactory growth. Preparation of the land should begin well before seeding, and in the finished seedbed the upper 2 in. should be well pulverized and the subsurface well settled and firm. Seeding from September 15 to October 15 at the rate of from 12 to 20 lb. per acre is suggested.

Strains of common alfalfa from Oklahoma, Kansas, and northern New Mexico have given very satisfactory yields and are preferable to hardy variegated alfalfas or hairy Peruvian and other nonhardy types. Cutting at the one-half and later bloom stages has given the best yields although at some sacrifice in quality. Curing tests indicated that during April and May alfalfa should be raked into single windrows from 4 to 6 hr. after cutting or into double windrows at least 6 hr. after. During June, July, and August the hay may

be raked into single windrows as soon as cut or 2 hr. after cutting or into double windrows from 2 to 4 hr. after cutting, depending upon yield and prevailing weather. Seasonal conditions most favorable for seed setting and profitable seed yields often have occurred at the time of the third or fourth cutting.

Growing buckwheat, K. S. QUISENBERRY and J. W. TAYLOR (*U. S. Dept. Agr., Farmers' Bul. 1835 (1939), pp. [2]+17, figs. 10*).—The varieties of buckwheat, its distribution and adaptation, soil and climatic requirements, cultural and field methods, and harvesting, threshing, and milling practices are described, and information is given on diseases and enemies and on the uses of buckwheat as a feed, weed destroyer, soil renovator, catch crop, orchard cover, and as a honey plant. This publication supersedes Farmers' Bulletin 1062 (E. S. R., 41, p. 827).

Illinois corn preformance tests, 1939, R. R. COPPER, G. H. DUNGAN, A. L. LANG, J. H. BIGGER, B. KOEHLER, and O. BOLIN. (Coop. U. S. D. A. et al.). (*Illinois Sta. Bul. 463 (1940), pp. 169–216, figs. 8*).—Corn on the 10 fields in the 1939 tests (E. S. R., 81, p. 38), including 331 hybrids and 29 open-pollinated varieties, averaged 80.2 bu. per acre, 28.2 bu. above the State average. During the 6 yr. (1934–39) of these tests, average yields on the test fields exceeded the average State yields by 111, 94, 79, 64, 47, and 53 percent, respectively. The 5 best hybrids on all 10 fields averaged 16.5 bu. of sound corn per acre above the 5 open-pollinated varieties and also had 12.7 more erect plants per 100, and exceeded the 5 open-pollinated corns in yield of sound corn and in percentage of erect plants on every test field. In 5 sections of the State even the 5 poorest hybrids averaged above open-pollinated varieties in yield of sound corn. Four-, 3-, and 2-yr. summaries are presented for most fields. The 4-yr. average yield of hybrids in relation to open-pollinated checks compared favorably with the average of hybrids in the 3-yr. and 2-yr. summaries.

In comparisons for susceptibility to stalk rot on three fields, hybrids markedly susceptible to *Diplodia* stalk rot were low-yielding. Stewart's disease was most severe on the Sullivan field. There was some damaged corn on all test fields due to ear rots, but hybrids appeared to have no striking advantage over open-pollinated varieties in resistance.

Soil-adaptation tests showed that hybrid corn grown on soil of high fertility will produce very high yields, and, in fact, respond more markedly to good soil-treatment practices than do open-pollinated varieties. Hybrids, however, do not perform even relatively as well on poor soils as on good soils.

The performance of corn hybrids in North Carolina, P. H. HARVEY and G. K. MIDDLETON (*North Carolina Sta. Agron. Inform. Cir. 124 (1940), pp. [2]+14*).—Reports of tests in 1938 (E. S. R., 80, p. 614) and 1939 showed that Corn Belt and Northern hybrids are generally unadapted to North Carolina conditions. Farmers are advised to continue growing varieties recommended for their respective sections, which are listed in this publication.

The Ohio cooperative corn performance tests, G. H. STRINGFIELD, R. D. LEWIS, and H. L. PFAFF. (Coop. U. S. D. A. and Ohio State Univ.). (*Ohio Sta. Spec. Cir. 59 (1940), pp. 27, fig. 1*).—Acre yields, dry matter in ears at harvest, percentage of lodged and broken plants, and test weights are tabulated for hybrids and open-pollinated corn varieties harvested from 49 tests grown in 1939 in 12 adaptation areas for corn hybrids in Ohio. The test methods and organization are described briefly. Begun in 1938, the tests are conducted in cooperation with Ohio seed growers and county seed corn associations, the extension service, and the U. S. D. A. Bureau of Plant Industry.

Kudzu, its value and use in Alabama, D. G. STURKIE and J. C. GRIMES (*Alabama Sta. Cir. 83 (1939), pp. 20, figs. 6*).—Kudzu, a perennial, drought-

resistant legume valuable for hay, temporary grazing, cutting and feeding green, soil improvement, and for preventing erosion, has averaged over 2 tons of hay per acre and has supplemented permanent pasture for beef and dairy cows with no harmful effect on flavor or odor of milk or butter. The crop may be grazed by hogs and partly replace protein supplements but will not fatten them if no other feed is supplied. It excels for poultry, either hand-fed or grazed, from May until frost. Propagated by seedling plants, crowns, or vine cuttings, kudzu should be planted on well-prepared land in winter or early spring before growth begins and fertilized with phosphate and cultivated the first year after setting. Established kudzu should be fertilized with phosphate or manure and the soil plowed or disked in late winter. Kudzu is easily destroyed by close grazing or by plowing.

A revision of Circular 57 (E. S. R., 64, p. 736), this publication reports experiments leading to the above suggestions and to recommendations on cutting, curing, grazing, propagation, and cultural practices for different purposes.

Lespedeza sericea and other perennial lespedezas for forage and soil conservation, A. J. Pieters (*U. S. Dept. Agr. Cir. 534 (1939), pp. 44, figs. 27*).—Information based extensively on research of State experiment stations and the Department is given on the growth habits of *L. sericea;* its climatic and soil adaptations; cultural requirements when grown for hay, pasture, and seed; diseases and weed control; composition and feeding value of the hay; the uses of sericea for meal, silage, grazing, wildlife, soil improvement, and erosion control; and its place in the soil conservation program. Characteristics of varieties of *L. sericea*, native American, and other perennial species are mentioned, and chromosome numbers in lespedeza are indicated.

The annual lespedezas as forage and soil-conserving crops, A. J. Pieters (*U. S. Dept. Agr. Cir. 536 (1939), pp. 56, figs. 24*).—Varieties of annual lespedeza, their geographical range and history, and climatic adaptation and drought resistance are discussed; cultural and field practices and methods of handling the crop for hay, seed, and pasture are outlined; and information is given on the feed value of the hay and leaf meal, diseases and insects and their control, the value of annual lespedeza in rotation, in orchards, and in erosion control, and its use in the soil conservation program, in strip cropping, protecting meadow waterways and terrace flow lines, and in pastures. The information is based largely on research of the Department and State experiment stations.

The Columbia spring oat, L. R. Neel (*Tennessee Sta. Cir. 66 (1940), pp. 2*).—Columbia oats (E. S. R., 65, p. 332), a Missouri Experiment Station selection from Fulghum, has outyielded other superior varieties, as Fulghum and Burt, at the Middle Tennessee Substation. Tests suggest seeding spring oats in late February or early March and applying about 100 lb. per acre of sodium nitrate in late March or early April and, where needed, 200 lb. of superphosphate for oats alone or from 300 to 400 lb. for oats in mixture with a grass or legume.

Soil fertility investigations with peanuts, E. R. Collins and H. D. Morris (*North Carolina Sta. Agron. Inform. Cir. 123 (1940), pp. [1]+7*).—Peanut yields in the second year of tests noted earlier (E. S. R., 81, p. 39) and longer fertilizer tests on different soil types are tabulated, with recommendations as to soils, lime, gypsum, and fertilizers.

Potato growing in Rhode Island, T. E. Odland and T. R. Cox (*Rhode Island Sta. Misc. Pub. 5 (1940), pp. [1]+19*).—Information derived from extensive experimentation and not yet published is summarized, with observations on methods and practices generally found successful by potato growers in Rhode Island.

Indicated practices include choice of Green Mountain for the late crop and Irish Cobbler for the early crop, possibly Chippewa for an intermediate season

crop, and Sebago as a late variety; use of disease-free seed, northern-grown rather than home-grown, and either cut or uncut seed; early planting in 36-in. rows with seed pieces 12 in. apart; use of treatments recommended for insect and disease control; soil reaction between pH 5.2 and 5.6; magnesium deficiency compensated by soluble magnesium in fertilizer or dolomitic lime; application of fertilizer high in potassium, such as the generally used 5-10-10 or 4-8-10, or higher analyses, as 8-16-16 or 7-14-21; the rate of 1 ton per acre of 5-10-10 fertilizer with lesser amounts of concentrated grades or where the crop is grown in a rotation including legumes or manure; placement of fertilizer in bands on each side of and about 2 in. away and slightly below the seed piece; short rotations where potatoes are the main crop and longer when other crops are important; use of cover or green manure in continuous potato culture; careful handling of the potato crop at digging, storing, grading, and hauling to the market: cool ventilated storage between 35° and 40° F.; and grading to command a top market price.

Eleven years of soybean investigations: Varieties, seeding, storage, W. L. BURLISON, C. A. VAN DOREN, and J. C. HACKLEMAN. (Coop. U. S. D. A.). (*Illinois Sta. Bul. 462 (1940), pp. 121-167, figs. 12*).—Grain, hay, and straw yields and general performance of about 65 varieties of soybeans grown on experiment fields in the State, 1927-37, are reported, with results of seeding and storage tests with the Illini variety, supplementing an earlier report (E. S. R., 59, p. 629).

Varieties of soybeans recommended for grain production, based on quantity yields, shattering, lodging, color of bean, and time required for maturing, are for northern Illinois, Manchu Selection (Thomas), Manchu (Thomas), Manchu (Wisconsin), Strain B, and Black Eyebrow; central Illinois, Illini, Dunfield, Manchuria 13-177, and Manchu; and for southern Illinois, Morse Selection 230, Scioto, Mansoy, Macoupin, Manchuria 13-177, and Illini.

Strictly hay varieties did not in general yield either more or better hay than did grain varieties. Plants of 16 varieties in the best growth stage for hay, i. e., pods well-filled but leaves not yet starting to fall, averaged about one-third leaves, one-third stems, and one-third pods when weighed and oven-dried. During field-curing and harvesting of 24 varieties for hay, about 74 percent of the oven-dry weight of leaves, 77 percent of stems, and 89 percent of pods were saved. Straw yields of varieties recommended for northern Illinois averaged 1.14 tons per acre, for central Illinois 1.20 tons, and for southern Illinois 1.14 tons.

Illini soybeans gave higher acre-yields in 24-in. rows than in rows 8 in. apart. For beans drilled in 8-in. rows, from 90 to 130 lb. of seed an acre averaged slightly better yields than other rates, and for those drilled in 24-in. rows from 50- to 70-lb. seedings slightly exceeded other rates. Grain yields from May 1, 10, and 20 seedings did not differ markedly but surpassed June seedings as an average of 12 varieties.

Soybeans grown from seed of 5 varieties stored indoors in metal cans and planted 1, 2, and 3 yr. after the spring following harvest averaged slightly lower in grain yields than beans grown from seed planted the spring after harvest. Sharply reduced grain yields came from beans so stored 4 yr. or longer. Illini soybeans taken from various depths in an outdoor test crib varied considerably in moisture content; those at the upper levels absorbed water the faster. Germinability varied with age and depth in the crib. Beans from upper levels showed reduced vitality even in the first spring after harvest, and when 2 yr. old were worthless for seed. Those from the lower levels retained vitality fairly well until the third season after harvest but were of little value when planted the fourth season. Greater acidity was found in beans from upper levels after 3 yr. of storage than in those from the lower levels. Depth of storage did not

especially affect iodine number, refractive index, oil and protein contents, percentages of total and soluble nitrogen, and carbohydrate content.

Taro varieties in Hawaii, L. D. WHITNEY, F. A. I. BOWERS, and M. TAKAHASHI. (Coop. U. S. D. A.). (*Hawaii Sta. Bul. 84 (1939), pp. 86, pls. 6, figs. 6*).—The descriptions of 84 distinct forms of taro (*Colocasia esculenta*), including 69 native varieties, 10 from the South Seas, 3 Japanese, 1 Chinese, and 1 presumably Asiatic, cover general characteristics, petiole, leaf blade, corm, inflorescence, origin and name, distribution, and uses. Historical and botanical notes and a determinative key to the 74 varieties persisting in the station collection precede the descriptions, to which are appended finding lists, glossaries of botanical and Hawaiian terms, literature cited, and an index.

[**Seed and inoculant research**] (*Farm Res.* [*New York State Sta.*], *6 (1940), No. 1, pp. 9, 14, fig. 1*).—Seed Notes (p. 9) points out that some lots of barley are not suitable for planting because germination is too low and weak due to several causes, and that field tests are necessary to appraise the merits of seed corn as to yield, adaptation, and trueness to type. It's in the Bag, by M. T. Munn (p 9), describes the general quality of commercial seed sold in New York as shown by laboratory and control field tests. Weak Seed Fails, by S. F. Patrick (p. 9), discloses that poor field stands often are traceable to use of seed low in vitality. A substantial percentage of 1,027 samples of commercial vegetable seeds tested in 1939 were deficient in germination. Legume Inoculant Testing in New York State, by A. W. Hofer (p. 14), reviews the development of the work up to a $2,000,000 industry and indicates the functions of the station in testing quality of inoculants.

Commercial agricultural seeds, 1939, G. P. STEINBAUER (*Maine Sta. Off. Insp. 174 (1939), pp. 100–120*).—The purity, germination, hard seed content (in legume seed), and noxious weeds, where present, are tabulated for 129 samples of agricultural seed collected from dealers in Maine in 1939.

HORTICULTURE

[**Horticultural studies conducted by the Bureau of Plant Industry**] (*U. S. Dept. Agr., Bur. Plant Indus. Rpt., 1939, pp. 9, 10, 11, 16, 17, 18, 19, 20, 21*).—Among investigations discussed are the production of ephedrine under irrigation; production of dill-herb oil; growing of canaigre, a potential tannin plant; breeding of mildew-resistant hops; development of farm windbreak plantings; early thinning of apple fruits to promote annual bearing; use of leaf analyses to determine the potash needs of apple trees; breeding of fruits, almonds, and vegetables; culture of the pecan; use of low temperature for regulating the time of Easter lily bloom; use of sulfur dioxide and carbon dioxide for prolonging the storage life of fruits; and the ventilation of refrigerator cars used for orange shipment.

[**Horticultural studies by the Colorado Station**] (*Colorado Sta. Rpt. 1939, pp. 34, 35*).—Among studies the progress of which is discussed are the testing of vegetable varieties, breeding of lettuce, testing of fruit varieties, soil management and fertilization of sour cherries, culture of the strawberry, and the effect of soil treatments on the yield and quality of carnations.

[**Horticultural studies by the Georgia Station**] (*Georgia Sta. Rpt. 1939, pp. 17, 67, 74–80, 84–86, 89, 91, 92, 93, figs. 10*).—Studies covered in this report include sweet corn breeding, development of peaches in the 4-week period preceding maturity, storage of peaches, root development of the pepper plant, lack of value of seed from roasted pimiento peppers for planting, fertilizers for pimientos, breeding of collards, soil erosion control in peach orchards, root de-

velopment of peach trees, breeding of muscadine grapes, and tests of fruit and vegetable varieties at the Mountain Substation.

[Horticultural studies by the Maryland Station] (*Maryland Sta. Rpt. 1939, pp. 22, 23, 25, 46–48, 61–70, figs. 2*).—Included are brief reports on the following investigations: Sweet corn production and breeding; the isolation of improved selections of American wormseed; cytogenetics of *Gladiolus*; factors affecting maturity, shipping, and storage of apples; spacing of peach trees; factors influencing color of apples; propagation of fruit and ornamental plants (coop. U. S. D. A. et al.); relations of soil moisture, age of plants, spacing, and mineral nutrients to flower differentiation, yield, and quality in the strawberry; removal of spray residues from the apple; adaptation of fruit varieties and seedlings; effect of environment and culture on the growth and fruiting of the apple and raspberry; factors involved in spray injury; the grading of canning peas; variety and strain tests of peas; fertilizer placement for peas; the breeding of lima beans; variety tests of vegetables; treatment of tomato seed with growth-promoting substances and with low temperature; breeding of cantaloups; sources of N for canning peas; and the effects of organic matter in the production of tomatoes.

Inducing changes in plants with colchicine shows progress, R. R. Nebel (*Farm Res. [New York State Sta.], 6 (1940), No. 1, pp. 10, 15, fig. 1*).—Briefly describing the effects of colchicine on the chromosomes of plants, the author reports success in producing some tetraploid tissue in Red Spy and Jonathan apples and in producing new types of snapdragons and marigolds.

Fungicides and insecticides, 1939, E. R. Tobey (*Maine Sta. Off. Insp. 174 (1939), pp. 121–133*).—Herein are presented the results of analyses by the station in 1939 of 60 samples of fungicidal and insecticidal materials collected by the State department of agriculture. The text of the State law is appended.

Plant breeding problem of station, A. M. Binkley (*Colo. Farm Bul. [Colorado Sta.], 2 (1940), No. 1, pp. 8–10*).—Stating that vegetable crops may be divided into three groups, (1) naturally self-pollinated, (2) naturally cross-pollinated, and (3) vegetatively propagated plants, the author discusses breeding technics applicable to each. The importance of breeding vegetables resistant to disease is stressed, with examples of *Fusarium* wilt-resistant varieties cited.

[Vegetable studies by the Iowa Station], E. W. Lindstrom, E. S. Haber, and A. T. Erwin (*Iowa Sta. Rpt. 1939, pt. 1, pp. 154, 155, 195, 196–198, 199, 201*).—Brief reports are presented on studies relating to polyploidy in the tomato; stability of homozygous lines in the tomato; comparative growth rates of tomatoes with different chromosome complexes; time of cutting and spacing of asparagus; variety tests of watermelons, snap beans, cucumbers, lima beans, and tomatoes; design of vegetable varietal test plats; and variety testing and improvement of muskmelons.

[Vegetable studies by the Cornell Station], R. A. Emerson, H. M. Munger, C. H. Myers, J. E. Knott, R. D. Sweet, E. M. Andersen, P. H. Wessels, H. C. Thompson, R. H. White-Stevens, H. S. Cunningham, G. J. Raleigh, R. L. Carolus, C. H. Dearborn, O. A. Lorenz, H. Platenius, P. Work, and A. E. Griffiths (*[New York] Cornell Sta. Rpt. 1939, pp. 145, 146, 179–185, 186, 187*).—Brief progress statements are presented on the following investigations: Breeding melons for resistance to *Fusarium* wilt; breeding of cabbage for resistance to *Fusarium* diseases and for quality; adaptation and soil management of vegetable crops grown on muck soils (coop. U. S. D. A.); varietal and cultural studies with lettuce; factors influencing the development of tipburn in lettuce; fertilizer requirements of vegetable crops; breeding of cauliflower

for resistance to black rot and for general improvement (coop. N. Y. State Expt. Sta.); breeding of celery for resistance to yellows and for better quality; relation of nutrient deficiencies and ratios in various soils to the yield and behavior of vegetable crops; vegetable handling and storage; use of small cold-storage plants on the farm for precooling and holding vegetables; the effects of wax emulsions on the keeping of vegetables; and the effect of certain environmental factors, such as moisture and temperature, on the dormancy and viability of vegetable seeds.

Test shows leading bean varieties in Crystal Springs area, J. A. CAMPBELL and L. R. FARISH (*Miss. Farm Res.* [*Mississippi Sta.*], *3* (*1940*), *No. 1, p. 2*).—Of several varieties tested in 1939, Tennessee Green Pod and U. S. No. 1 Mosaic Resistant Refugee, in the order given, were the most productive, the former yielding more than twice that of the lowest-ranking variety.

The effect of root temperature upon the absorption of water by the cucumber, R. A. SCHROEDER (*Missouri Sta. Res. Bul. 309* (*1939*), *pp. 27, figs. 23*).—Noting that late-autumn crops of cucumbers grown in the greenhouse frequently show injury as cool weather commences, the author placed plants in crocks set in tanks of water the temperature of which was controlled. The results indicated that the critical temperature for water movement through the cucumber root is between 60° and 70° F. Higher root temperatures gave an increased absorption of water, but it is considered doubtful whether the increase is sufficient under practical conditions to warrant the added cost of raising the soil temperature higher than 70°. It is thought that the leaf and fruit injury observed in fall cucumber crops in Missouri is due to a deficiency of water in the affected parts. This deficiency apparently results from a set of conditions wherein transpiration is in excess of the amount of water supplied through the roots, thus emphasizing the interrelationship between the rate of transpiration, root temperature, and wilting. The degree of injury varied with the condition of the plants. In general, the more vigorous the plant and the more rapid the temperature change, the more severe was the injury. A constant soil temperature of 60° was not adequate to provide satisfactory growth, leading to the conclusion that 70° apparently is the most practical soil temperature for growing cucumbers. Watering with cold water tended to lower the soil temperature, sometimes sufficiently to induce typical fruit and leaf injury.

The Geneva Delicata squash, W. D. ENZIE (*Farm Res.* [*New York State Sta.*], *6* (*1940*), *No. 1, pp. 1, 13, fig. 1*).—A brief account is given of the development and characteristics of a new squash found to be mosaic resistant and to possess very good baking quality.

Closer spacing for higher yields of marketable tomatoes, L. R. FARISH and J. A. CAMPBELL (*Miss. Farm Res.* [*Mississippi Sta.*], *3* (*1940*), *No. 1, p. 4*).—In trials at State College and Crystal Springs in 1938 and 1939 the highest yields of marketable fruits, in both 1 and 2 grades, were produced on plats with closely spaced plants. There was observed at State College an advantage in production of early fruit from pruning to a single stem. On the whole, the size of marketable fruits was affected very little, if any, by spacing.

[Pomological studies by the Iowa Station], T. J. MANEY, B. S. PICKETT, H. L. LANTZ, and H. H. PLAGGE (*Iowa Sta. Rpt. 1939, pt. 1, pp. 177–193, figs. 3*).—Progress of the following studies is discussed: The growing of uniform stocks for propagation of the apple; development of new stocks, particularly dwarfing stock for the apple; soil management of apple orchards; apple, pear, and plum breeding; inheritance of certain characters such as fruit size, color, and flavor in the apple; development of hardy varieties of peaches by crossing domestic characters with hardy species; variety tests of apples; hybridization

of black raspberries to secure resistance to anthracnose; respiration in the Jonathan apple as related to ripening and keeping after harvest; varieties of strawberries for southeastern Iowa; culture and fertilization of strawberries; stock and scion influences in the apple; breeding and testing of rose stocks; effectiveness of plant growth-promoting substances on the rooting of horticultural plants; and the freezing preservation of fruits and vegetables in refrigerated lockers.

[**Pomological studies by the Cornell Station**], A. J. Heinicke, L. H. MacDaniels, T. Shen, D. Boynton, W. Reuther, W. H. Childs, L. J. Edgerton, A. J. Loustalot, M. B. Hoffman, D. S. Welch, R. M. Smock, E. F. Savage, and A. Van Doren (*[New York] Cornell Sta. Rpt. 1939, pp. 158, 159, 159–162*).—Studies the progress of which is discussed include the duration of the influence of pruning on trees of bearing age; effect of different types of pruning in modifying the alternate bearing habit in normally biennial varieties; the induction of early and regular bearing in apple and pear trees by ringing and fruit thinning; soil management of apple orchards; soil factors associated with significant differences in yield and behavior of fruit trees; growth and activity of roots of fruit trees under varying soil and cultural conditions; nutritional conditions of fruit-tree tissues and their relation to biennial bearing, etc.; photosynthetic efficiency of apple foliage as influenced by sprays and fertilization of the soil; factors other than pollination that influence the dropping of flowers and fruits; pollen requirements of fruit varieties under orchard conditions; wound dressings for fruit trees, with special reference to winter injury; comparative efficiency of oiled wrappers, shredded oiled papers, different waxes, and ozone for controlling apple scald and shriveling; relation of climatic, soil, and cultural conditions, and maturity to the keeping of apples; and the effect of modified storage atmospheres on the keeping quality of apples.

Selection, care, and planting of nursery-grown fruit trees (*New York State Sta. Cir. 188 (1940), pp. 31, figs. 12*).—This is a presentation of general information.

Spraying the home orchard, P. H. Shepard and G. Rook (*Missouri Fruit Sta. Cir. 29 (1940), pp. 8*).—Along with general information, spray schedules are presented for the apple, peach and plum, cherry, pear, grape, and certain small fruits.

Use of fertilizer in orchards presents special problem—production is index, L. R. Bryant (*Colo. Farm Bul. [Colorado Sta.], 2 (1940), No. 1, pp. 6, 7*).—Information is given as to desirable materials, rates of application, indications of fertilizer needs, etc.

The potassium nutrition of fruit trees.—II, Leaf analyses, O. Lilleland and J. G. Brown. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 91–98, figs. 4*).—In this second paper (E. S. R., 80, p. 486), the authors discuss the results of analyses of leaves collected at monthly intervals beginning in early June from bearing and nonbearing trees differing in fertilizer and pruning treatment and also of the leaves from healthy and scorched areas. It was evident that leaf analyses to establish the K status of nonbearing fruit trees should preferably be made on material collected early in the summer. Mobility in the leaf is characteristic of the element K, and heavy crops and severe pruning (presumably through their effect on the crop) influenced the migration. Ca and Mg, on the other hand, appeared little affected by crops or pruning.

There was evidence that an increase in K in the leaf results in a reduction in the Ca and Mg contents. The maximum K content of the leaf was attained when the replaceable (or Neubauer) K in the 0- to 4-ft. soil depth was raised to 200 p. p. m. In general, there was no indication of K deficiency during the first 2 or

3 yr. in the orchard. In bearing trees there was evidently a movement of the K from the leaves to the fruit, so that the leaf analyses no longer served as an indication of the K needs of the tree. In studies with leaves of various species of fruits and nuts there appeared to be a general trend toward a lower percentage of K as the season advanced, but when the leaves were examined on the basis of milligrams per leaf there was no such trend. On the whole, it was clear that the K content of fruit-tree leaves is rather variable and that many individual analyses are necessary for dependable conclusions. The comparative value of the Thornton method and the standard leaf analysis is discussed.

Low temperature effects on woody plants, G. F. Potter. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 185–195*).—This paper, accompanied by a bibliography of 61 citations, reviews the status of knowledge relating to low temperature injury, particularly as concerns fruit production in the northern United States.

Low-temperature effects on the physiology of plant organs in relation to commercial storage, R. C. Wright. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), p. 196*).—Chilling injury is described, with a statement that it may result from exposure to critical temperatures several degrees above the freezing point. Particularly, this may be true in the case of horticultural products from the tropical zone, although apples, pears, and cranberries likewise may be injured. The sugar content in a few products such as the potato was increased at temperatures just above freezing at the expense of the starch. Respiration is definitely slowed in most cold-stored products. The effect of low-temperature exposure on subsequent ripening and on the development of decay is pointed out.

Internal gas in fruits as influenced by external treatments.—I, Carbon dioxide, L. L. Claypool. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 374–378, figs. 2*).—Using as material pears, apples, peaches, nectarines, and plums stored in atmospheres varying in carbon dioxide content from that of air up to 85 percent and at temperatures of 32°, 40°, 45°, and 70° F., the author made determinations of the internal contents of carbon dioxide. Fruits with high rates of respiration contained the greatest amounts of carbon dioxide. As the percentage of carbon dioxide in the external atmosphere was increased, the amount in the fruit tissue also increased. Under similar atmospheric conditions, the lower the temperature, the greater was the amount of carbon dioxide in the fruits. The results indicated that the internal carbon dioxide content of waxed fruits varied considerably more than was the case with nonwaxed gas-stored fruits. The build-up in carbon dioxide in waxed fruits was greatest from one to a few days after treatment, declining thereafter and, in some cases, becoming less than the controls. More carbon dioxide was found in waxed fruits held at 45° and 70° than at 32°.

Anatomical studies of stems and roots of hardy fruit trees.—II, The internal structure of the roots of some vigorous and some dwarfing apple rootstocks, and the correlation of structure with vigour, A. B. Beakbane and E. C. Thompson (*Jour. Pomol. and Hort. Sci., 17 (1939), No. 2, pp. 141–149, pls. 4*).—In continuation of this series [5] an examination of the transverse sections made of the roots of 86 4-year-old Lane Prince Albert apple trees on Malling VII and IX roots and on 8 new clonal rootstocks showed a striking correlation between the relative area of bark to wood and the vigor of the scion. The percentage area of fibers, vessels, rays, and, to a less extent, of parenchyma was found to bear a marked relation to the vigor of the scion. The greatest correlation was

[5] A preliminary report on the internal structure of the wood of No. IX rootstock in relation to scion-rooting of apples, A. B. Beakbane and M. E. Renwick (East Malling [Kent] Res. Sta. Ann. Rpt., 23 (1935), pp. 100–106, pls. 2).

in the wood ray tissue. In 4 vigorous rootstocks—Malling VII and 3 clons—there was observed an almost equal amount of living and dead tissue in the wood, whereas the 6 more dwarfing stocks showed from 2 to 3 times as much living tissue. There was a tendency for the more vigorous stocks to possess larger vessels than did the dwarfing rootstocks.

Influence of the stocks on the performance of certain apple varieties, G. E. YERKES and R. H. SUDDS. (W. Va. Expt. Sta. coop. U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 116–120*).—Observations at Kearneysville, W. Va., where there was established in 1933 a planting of various seedlings and clonal rootstocks budded with Gallia Beauty, Starking, Staymared, and York Imperial, showed small losses of trees except on Malling XII and Red Siberian. Two of the clonal rootstocks, Nos. 316 and 329, developed by the U. S. Department of Agriculture were used in alternate third rows throughout the orchard to serve as standards for comparison. Seedlings of Rome Beauty, Jonathan, and McIntosh have, in general, induced growth approximating that made by trees on the two clons. Seedlings of French crab, Delicious, Grimes Golden, Wealthy, and Winesap supported scion growth of somewhat smaller size. Northern Spy and also Malling I had some dwarfing effect on the four scions. Malling II gave promise where some dwarfing was desirable.

As to fruiting, it was too early to draw conclusions. The yields varied so greatly between individual trees that the averages had little significance. Malling I and Northern Spy roots apparently stimulated early blooming in Gallia Beauty, Staymared, and York Imperial.

The behavior of Malling apple rootstocks in the nursery, H. B. TUKEY and K. D. BRASE. (N. Y. State Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 113–115*).—Based on observations covering 11 yr. and involving the propagation of over 100,000 rooted plants and 20,000 budded trees, information is given on the habits of growth, rooting tendencies, hardiness, capacity to take buds, and general value of 14 Malling rootstocks. Summing up, the authors state that Malling II and XVI take a wide assortment of buds equally well; Malling XII and XIII take a less wide assortment; and Malling I shows incompatibility. The most easily rooting types, I, IV, VII, IX, and XIII, produced the best stands as lining-out stocks, and II, XII, and possibly XVI (less easily rooting types) produced relatively poorer stands.

Potassium content of leaves from commercial apple orchards, L. P. BATJER and J. R. MAGNESS. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 197–201*).—Quantitative determinations of K in leaf samples collected from Jonathan, Rome Beauty, Delicious, York Imperial, and McIntosh trees in 21 orchards scattered through many States showed considerable difference among varieties and between the leaves of any one variety collected at different locations. This latter difference was particularly marked between orchards in the Potomac River Valley. The K content of leaves of Delicious averaged significantly higher than those of the other varieties. The leaves of York Imperial and Jonathan had lower values than Delicious in all but one orchard located in Missouri. In one orchard, leaf samples collected at several intervals following mid-July showed a slight decrease in the K content in late August, which suggests a possible partial migration of K prior to abscission. The possible use of leaf analyses as a key to the K needs of apple orchards is discussed.

Abscission of flowers and fruits of the apple, M. McCOWN. (Purdue Univ.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), p. 320*).—In this study of the anatomical development of the tissues involved in the abscission process and the mode of abscission of flowers and fruits of certain varieties of apples, the author states that the abscission of blooms and of immature fruits until the end of the June drop is preceded by the formation of an abscission layer by secondary cell divi-

sion. Abscission of the mature pedicels is initiated independently in the pith and cortex. Separation in the tissues in the mature pedicel is not preceded by secondary cell division. Although an abscission zone persisted at the base of the mature pedicel, this zone did not predetermine the path of the abscission, which occurred either in the abscission zone or in the pedicel distal to the zone.

Further investigations on the relation of pruning to set of fruit in pears, W. W. ALDRICH and J. H. GRIM. (U. S. D. A. and Oreg. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 328–334*).—Continuing this study (E. S. R., 78, p. 195), evidence was again secured that dormant pruning increased the percentage of blossoms to set fruit sufficiently to more than compensate for the reduction of blooms incident to pruning. Defloration also increased the set of blossom buds, although to a somewhat lesser degree. Pruning and also partial defloration increased the dry weight per spur of the blossoms just before full bloom and of the peduncles and small fruits immediately after petal fall. Data on carbohydrates when expressed as absolute amounts per spur indicated that pruning did not greatly affect the total carbohydrates per spur, the samples being taken just before full bloom. The total amount of nitrogen per spur was increased, possibly before full bloom and certainly by petal fall, as a result of defloration or pruning. Since applications of ammonium sulfate to nitrogen-deficient trees resulted in approximately as great an increase in nitrogen supply to the blooms as did defloration or pruning but did not cause the same increase in set, it appeared that the increase in nitrogen per spur, which followed defloration or pruning, was not the causal factor in the increased set. On the theory that pruning decreased the transpiring area in proportion to the temporarily unaffected root area and thus increased the water supply to the leaves, leaf samples were collected during full bloom. These showed no difference in the percentage of water in the morning but did show a lesser decrease during the day for the pruned trees. However, injections of water into scaffold limbs had no effect on the set of fruit. The possibility that pruning may have increased respiration near the cuts or activated certain enzymes or growth-promoting substances is suggested.

Five new peach varieties especially adapted to mild winters, J. W. LESLEY (*California Sta. Bul. 632 (1939), pp. 19, pls. 6, figs. 2*).—The usual varieties of peaches are said to require a certain amount of low temperature to complete their dormancy and permit their normal blooming and foliation. Varieties of the South China and Peento groups, on the other hand, need relatively little chilling. F_1 hybrids between parents representing both groups tended to be intermediate in respect to their chilling requirements but were more like the parent which requires the less chilling. The author discusses the origin and presents technical descriptions of five new varieties—Rosy, Golden State, Ramona, Hermosa, and Sunglow—bred by the Citrus Experiment Station and combining the better fruit qualities of the ordinary commercial peaches with the low chilling requirements of the Peento and South China groups.

What new cherry varieties are doing: A survey of growers, R. WELLINGTON and H. O. BENNETT (*Farm Res.* [*New York State Sta.*], *6 (1940), No. 1, pp. 2, 12*).—Based on reports received from growers, the authors discuss the Seneca, Lyons, Emperor Francis, and Victor sweet cherries as to growth and fruiting characteristics and potential value for home and market use.

Summary of results of manurial experiments on black currants, raspberries, and strawberries at Long Ashton, 1924–1937, T. WALLACE (*Univ. Bristol, Agr. and Hort. Res. Sta., Long Ashton, Ann. Rpt., 1938, pp. 17–39*).—In presenting a summary of results the author reports that farmyard manure proved of great value for black currants and strawberries. Of the major elements, K appeared to be the primary limiting factor for raspberries and black currants and was possibly of some importance for the strawberry. N and

P were important for the culture of black currants. N had a significant effect on the growth but not on the yield of raspberries. In the case of the black currant, the incidence of leaf spot caused by *Pseudopeziza ribis* appeared to be decreased by K deficiency and increased by a deficiency of either N or P. The strawberry diseases, yellow edge and red plant, and the tarsonemid mite were not influenced by fertilizer treatments.

Promising new grapes—some of the best of the new red kinds, L. M. van Alstyne (*Farm Res. [New York State Sta.], 6 (1940), No. 1, p. 12*).—In this third article on grapes (E. S. R., 82, p. 194) the author describes the Goff, Urbana, Dunkirk, Keuka, Hanover, Hector, Yates, Ruby, and Bronx grapes—all red-fruited varieties originated by the station.

Training and pruning of grapes, C. H. Ragland (*Miss. Farm Res. [Mississippi Sta.], 3 (1940), No. 1, p. 2, figs. 4*).—General information is presented.

A bibliography on the avocado (Persea americana Miller), I. J. Condit (*California Sta., Citrus Expt. Sta., 1939, pp. [5]+293*).—This is a comprehensive list of titles arranged by subjects, such as history, botany, varieties, uses, etc.

Citrus orchard heating in Louisiana, F. D. Cochran (*Louisiana Sta. Bul. 312 (1940), pp. 27, figs. 12*).—Stating that there are no localities in Louisiana which are free from winter and spring frost and presenting data on the location and importance of citrus production in the State, the author discusses the results of 3 years' experiments with orchard and garden heating. The results were very satisfactory from the standpoint of protecting orange trees from low temperature under southern Louisiana conditions and suggested that the cost of such heating was sufficiently low in most years to be practical. As a rule, wind was not a serious factor because velocities were largely negligible during freezing periods. Because of the fact that trees vary in hardiness from time to time, it was not possible to establish definite temperatures for freezing injury. Based on the 3 years' results, it was indicated that heating would be necessary about 10 nights per year in the Belle Chasse area. As to costs, it is estimated that the investment for the paint-can type of oil heater should not exceed $100 per acre and that the annual cost for operating would range between $10 and $25 per acre. Summing up, the author concedes that orchard heating is a beneficial practice and one of the factors for success in citrus production in Louisiana. In addition, heaters were found valuable in protecting Easter lilies and certain valuable vegetable crops.

A comparative study of quality in oranges from Louisiana and other States, W. D. Kimbrough and G. N. Page (*Louisiana Sta. Bul. 311 (1939), pp. 16*).—Beginning in 1936, a series of comparative analyses were made of the physical and chemical composition of oranges from California, Florida, Louisiana, and Texas. An attempt was made to secure similar varieties and sizes in the different samples. In general there was noted a distinct variation in physical and chemical factors related to the source of the fruits. There was a seasonal fluctuation in certain characteristics, such as the percentage of the solids in the juice, as might be expected from variation in the seasonal rainfall. However, this fluctuation was not decisive enough to offset some of the fixed effects of local environment. For example, it is stated that California produced a very thick-skinned orange with high acidity and a high percentage of solids; Louisiana, an orange with a very thin rind and juice of superior taste; Florida, an orange with a low percentage of peel and a high volume and percentage of juice; and Texas, an orange that was very sweet because of a low ratio of acid: sugar. With very few exceptions, Louisiana oranges had the thinnest rinds and, in most cases, the highest percentages of juice, solids, and total sugars of the oranges from all of the States. An analysis of Louisiana-grown Satsuma oranges indicated that they were unusually high in desirable qualities.

Growth and fruiting of three varieties of pecans on different seedling rootstocks, B. G. SITTON and F. N. DODGE. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 121–125*).—The removal in 1937 of Mobile, Schley, and Stuart trees used as interplants in a pecan orchard established in 1930 at Robson, La., gave opportunity to measure the growth on the various rootstocks. Eight-year-old Schley trees on seedlings of the Moore pecan averaged 1.15 times as large and were 1.5 times as productive as seedlings on Waukeenah. Seven-year-old Stuart trees on Moore seedlings averaged 1.14 times larger than those on Waukeenah seedlings. Mobile trees on *Hicoria pecan* roots averaged 3 times larger and yielded an average of nearly 4 times as many nuts in 1937 as did Mobile trees on *H. aquatica*. The trees on the latter stock were chlorotic, and although this condition was partially corrected by spraying with ferric sulfate, it is concluded that the *H. aquatica* stock is not adapted to the highly alkaline soil used in the experiment.

[**Ornamental horticulture at the Cornell Station**], R. W. CURTIS, J. F. CORNMAN, A. M. S. PRIDHAM, K. POST, R. C. ALLEN, K. WHEELER, and H. T. SKINNER ([*New York*] *Cornell Sta. Rpt. 1939, pp. 139–141*).—Among studies the progress of which is noted are winter injury of ornamental woody plants, effect of temperature and length of day on the flowering of *Euphorbia* and *Poinsettia*, causes of blindness of chrysanthemums, effect of summer mulches on the nitrogen, phosphorus, potash, and lime contents of the soil as indicated by chemical tests and plant growth, use of organic materials in soil preparation for herbaceous plants, and propagation of rhododendrons and other ericaceous plants by cuttings.

Dahlia variety test, 1939, H. L. COCHRAN, D. D. LONG, and N. LAMOTTE (*Georgia Sta. Cir. 120 (1939), pp. 11, figs. 10*).—In addition to general information, descriptions are presented of a number of worthy varieties and new, unnamed seedlings (E. S. R., 80, p. 632).

Comparative study and indexing of peony and iris varieties, E. C. VOLZ (*Iowa Sta. Rpt. 1939, pt. 1, pp. 174, 175–177, figs. 2*).—Information is presented on new accessions and the behavior of varieties.

FORESTRY

German-English dictionary for foresters, O. RABER (*U. S. Dept. Agr., Forest Serv., 1939, pp. VI+346*).—Prepared primarily for the forester, this dictionary contains many other terms applicable to related fields, such as botany, entomology, ecology, soil science, engineering, etc.

[**Forestry studies by the Iowa Station**], D. LUBBERTS, G. B. MACDONALD, C. J. DRAKE, I. E. MELHUS, C. M. GENAUX, B. B. SPROAT, and A. L. MCCOMB. (Partly coop. U. S. D. A.). (*Iowa Sta. Rpt. 1939, pt. 1, pp. 150–154, figs. 2*).—Included are brief reports on the following investigations: Location and objectives of white pine plantations; nurseries for the propagation of soil erosion control trees, shrubs, grasses, and other plants; volume, growth, and yield studies of Iowa timber trees; nursery cultural practices; and the mineral nutrition of woody plants.

[**Forestry studies by the Cornell Station**], R. F. CHANDLER, JR., A. B. RECKNAGEL, E. F. WALLIHAN, and L. G. COX ([*New York*] *Cornell Sta. Rpt. 1939, pp. 105, 106, 143, 144*).—Brief progress statements are presented on the following studies: The calcium requirements of different tree species, and the correlation between this factor and the distribution of species with respect to the calcareous origin of the soil; base-exchange activities under different forest types; relation of soil character to forest growth in the Adirondack region; management of second-growth forest types; improved practices in the

production of forest planting stock of broad-leaved timber-tree species; and the establishment, culture, and development of forest plantations.

Classification of gley soils for the purpose of forest management and reforestation, S. A. Wilde. (Wis. Expt. Sta.). (*Ecology, 21 (1940), No. 1, pp. 34–44, figs. 6*).—The author recognizes three types of gley soil, (1) alpha, (2) beta, and (3) gamma. The alpha is a semiswamp type supporting stands of water-enduring species. Mosses and sedges are the characteristic ground cover, and such soils need drainage before planting to most forest species. The beta gley soils are transitional and suitable for the survival but not the successful growth of both upland and lowland species. Satisfactory growth on beta gley is hindered by a deficiency of available nutrients resulting from shallow rooting. Beta soils are not easily distinguished and are often planted inadvisedly. Gamma gley soils are characterized by the occurrence of more exacting species than are found on upland soils of similar texture. Sufficient depth of aerated soil, availability of nutrients, accessibility of ground water, and its relatively small seasonal fluctuation resulted in exceptionally rapid growth of trees and their general stability.

Tabulated data are presented on the correlation of the three types of gley soils with the composition and growth of forest vegetation in Wisconsin and on the chemical composition of podzol gley soils in Langdale County and degraded prairie gley soils in Dane County. The gley horizons of the podzol soil were characterized by a slight decrease in acidity due to the hydrolytic action of water and a partial destruction of the base exchange compound, apparently because of the reduction and solubility of iron. An accumulation of soluble phosphates in the gley layer was the outstanding feature of the Dane County soil.

A quadrat study of prairie and forest plantings, T. M. Sperry. (Univ. Wis.). (*Bul. Ecol. Soc. Amer., 20 (1939), No. 4, p. 33*).—Plantings of various species of forest trees and prairie plants were made on the University of Wisconsin Arboretum since 1934. In 1937 a number of "permanent" quadrats, each containing 9 m.^{2} were established. These were remapped in 1939, and it was found that there was a marked development and spread of all prairie grasses planted. An approximately equal development was found among the evergreen plantings, but no such corresponding development was noted among the hardwood plantings during the 2-yr. interval. The relative development may, of course, change over a longer interval of time. All plantings were made in old fields, and in all cases, except for one prairie planting, the soil was a very poor forest type.

What is climax forest in central Indiana? A five-mile quadrat study, J. E. Potzger and R. C. Friesner (*Bul. Ecol. Soc. Amer., 20 (1939), No. 4, p. 28*).—A quantitative and qualitative analysis of a 10-m. strip of forests totaling 5.5 miles was made. Climate apparently favors a beech-maple climax in the less favored locations. North-facing slopes and moist uplands support beech-maple, while south-facing slopes and sharp ridges support oak-hickory. Intermediate exposures have a less expressed dominance by a few species. The beech-maple type has a better-developed small tree layer than the oak-hickory type. *Viburnum acerifolium* is the most common and widely distributed shrub in the region. The four strata are made up of 73 woody species divided as 34 tall trees, 8 small trees, 15 tall shrubs to small trees, 8 small shrubs, and 8 lianas.

Ecological aspects of longleaf pine regeneration in south Mississippi, E. W. Gemmer, T. E. Maki, and R. A. Chapman. (U. S. D. A.). (*Ecology, 21 (1940), No. 1, pp. 75–86, fig. 1*).—Field tests showed that longleaf pine seed must be protected from birds and rodents, particularly the former, if a stand is to be established. In artificial reforestation the use of small wire tubes, mulches,

and mechanical drilling gave promising results. A heavy stand of second-growth old-field pine was a more effective cover than was grass or scrub oaks. Greenhouse studies showed that longleaf pine seed germinated and became established best on mineral soils and on light, well-watered humus. Heavy deposits of ash from recently burned litter were very detrimental. Hard, compact soil interfered with the penetration of the radicles, and mechanical loosening favored the establishment of seedlings. One or two soakings with water hastened germination. Because the stands from natural seed fall on burned and cultivated seedbeds were poorer than on natural rough, it was evident that the protective value of the rough is of primary importance.

Buried viable seeds in the forest floor of a series of stands representing stages of succession from old field to climax, H. J. OOSTING and M. E. HUMPHREYS (*Bul. Ecol. Soc. Amer., 20 (1939), No. 4, p. 32*).—Soil samples from abandoned fields of 10 age classes, ranging from fields still under cultivation through Andropogon and pine dominance to oak-hickory climax forest, were placed in flats and exposed to greenhouse conditions. After 37 weeks, when germinations ceased, 5,864 seedlings (127 species) had been produced. The highest total germinations were for 1-yr. fields, the greatest number of species for the 5-yr. fields. The germination data indicate that, under natural conditions, certain seeds may lie buried for long periods and retain their viability and that others are viable for only a short time. Statistical analyses indicate relationships between vegetation and buried seeds, differences between field and forest and between pine and hardwood, and that forest seeds apparently require forest conditions to retain their viability. Viable seeds, present for all age classes, showed a succession of species, in general correlated with the development of vegetation above ground.

The effect of depth of coverings on the germination of Douglas fir seed, VAN B. DEMICK, JR. (*Wash. Univ. [Seattle] Pubs., Theses Ser., 4 (1939), pp. 157–159*).—Seed taken from trees growing at three elevations—500–1,000, 1,500–2,000, and 2,500–3,000 ft.—was sown in three different types of soil and covered at various depths. The optimum depth was 0.25 in., and seed from the middle altitude gave the best results as measured by the duration of the germination period and the percentage of germination.

Effect of indolebutyric acid, indoleacetic acid, and alpha naphthaleneacetic acid on rooting of cuttings of some deciduous and evergreen trees of the Pacific Northwest, B. G. GRIFFITH (*Wash. Univ. [Seattle] Pubs., Theses Ser., 4 (1939), p. 301*).—Cuttings taken at 4 seasons in 3 successive years were, after treatment by immersing their bases in 10 different concentrations of the 3 acids cited, planted in the greenhouse in flats containing a sand-peat medium and held there for 160 days. Among observations were that dormant cuttings of Douglas fir, Sitka spruce, western red cedar, and cascara can be rooted successfully by treatment with either indoleacetic or indolebutyric acid, and that negative or very poor results were secured with western dogwood and western larch with all treatments. Abundant callusing was no indication of potential rooting. Measured in length of time needed for treatment, the period from February 20 to March 30 was the best time for taking Douglas fir, Sitka spruce, and western red cedar cuttings. Western red cedar responded favorably throughout a wide concentration of all 3 acids. The most effective dosages for Sitka spruce and Douglas fir were 25 and 50 p. p. m., respectively, for 24 hr.

[Value of different grades of white pine planting stock] (*Georgia Sta. Rpt. 1939, p. 93*).—Preliminary observations indicated that 2-year-old nursery stock is too small for underplanting run-down hardwood stands.

DISEASES OF PLANTS

Outline of diseases of cereal and forage crop plants of the northern part of the United States, J. G. Dickson (*Minneapolis, Minn.: Burgess Pub. Co., [1939], pp. [1]+VII+259*).—This manual covers the nonparasitic and parasitic diseases of barley, corn, oats, rye, sorghums and millets, wheat, flax, alfalfa and sweetclover, clovers, and soybean in the order named. Such detailed matters are considered as hosts, geographical distribution, economic importance, description of the disease, the causal organism (where parasitic) and its life history in relation to pathogenesis, and control measures. There is a list of bacteria and fungi parasitic on the field crops, arranged under the orders and families of the parasites, with the common hosts indicated. An index of diseases, parasites, and hosts is provided.

Diseases of economic plants in the Antilles [trans. title], M. T. Cook (*Puerto Rico Univ. Monog., Cien. Fis. y Biol., Ser. B, No. 4 (1939), pp. 530, pl. 1, figs. 171*).—Following an introductory account of the history of plant disease work in the area covered and a discussion of the more general phases of plant pathology and disease control, the main body of the monograph, translated into Spanish by J. I. Otero, is taken up with specific diseases arranged by host plants and discussed mainly as to cause, symptoms, and control. An index to hosts and diseases, including Spanish common names and Latin binomials, and a glossary of technical terms are provided. There is a preface by Otero.

Diseases of economic plants in China, I, S. C. Teng and S. H. Ou (*Sinensia, 9 (1938), No. 3-4, pp. 181-217*).—This report is based on observations made in Yangso, Kwangsi, during 1938, and deals with diseases of 26 fruit, vegetable, and field crops.

[**Phytopathological studies by the Bureau of Plant Industry**] (*U. S. Dept. Agr., Bur. Plant Indus. Rpt., 1939, pp. 14-16, 17, 18, 19, 21, 22, 23, 24, 32, 33, 34, 35, 36*).—Brief reports of progress are included on hemlock twig rust (*Melampsora farlowii*); decay of slash on clear-cut areas in the Douglas fir region; canker diseases of Douglas fir; western red rot (*Polyporus ellisianus*) of ponderosa pine; phloem necrosis, a killing virus disease of elms; lethal wilt diseases of forest and shade trees; stony pit of pear proved to be a virus disease; phony peach virus found only in wood or roots; a new spray effective against walnut blight; prevention of bacterial decay in new potatoes; two new diseases, viz, *Phytophthora capsici* decay of Winter Queen watermelons and other fruits and vegetables, and *Albugo occidentalis* on Texas-grown spinach; optimum conditions for mushrooms; factors determining the efficiency of nematocides; control of root knot nematode on tuberoses; leaf disease resistance in *Hevea;* chlorotic streak of sugarcane confined to Louisiana; mild sugarcane mosaic strain in Hawaii explains moderate injury; reduction in seedling diseases of sugar beets by planting in beds (coop. Ohio Expt. Sta.); new curly top-resistant sugar beet variety released; hybrid vigor utilized in new leaf spot-resistant sugar beet variety; wild species of *Nicotiana* as sources of disease resistance; methods developed for control of blue mold or downy mildew of tobacco; control of black shank in flue-cured tobacco areas; and distinctive effects of copper deficiency on growth of tobacco.

The Plant Disease Reporter, January 15 and February 1 and 15, 1940 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 24 (1940), Nos. 1, pp. 27, figs. 3; 2, pp. 29-49; 3, pp. 51-71, figs. 5*).—The following material is included in these issues:

No. 1.—The distribution of ring rot of potatoes (*Phytomonas sepedonica*) in the United States; occurrence of bacterial ring rot and of purple top wilt on

potato in Michigan, by J. H. Muncie; the potato wart eradication program in Pennsylvania, by T. P. Dykstra; collar rot infection on direct-seeded tomatoes, by H. R. Thomas; black shank (*Phytophthora [parasitica] nicotianae*) on tobacco in Kentucky, and tobacco diseases in Kentucky in 1939, both by W. D. Valleau and E. M. Johnson; first progress report on the *Phymatotrichum omnivorum* root rot losses in experimental windbreaks of Oklahoma and Texas, by E. Wright; the distribution of zilverblad or white streak (probably of virus nature) in narcissus plantings on the West Coast, by F. P. McWhorter; and brief notes on host plants of the charcoal rot fungus in California and *Phytophthora* crown canker of dogwood found in Massachusetts.

No. 2.—Three anthracnoses (*Colletotrichum destructivum, C. graminicola,* and *C. trifolii*) of alfalfa, by F. R. Jones and J. L. Weimer; spread of white pine blister rust during the calendar year 1939; varietal susceptibility of peppers to *Phytomonas vesicatoria* spot, by J. G. Horsfall and A. D. McDonnell; incidence of disease in common-bean-mosaic resistant and nonresistant Green Refugee beans in New York, season of 1939, by O. A. Reinking; serious and unusual diseases of tomato, pepper, potato, eggplant, bean, squash, broccoli, and peanut in southwest Texas, by P. A. Young and A. L. Harrison; cane blight or dieback (*Botryosphaeria ribis*) of currant in New York, by E. M. Hildebrand; the fruit disease situation in northern Virginia during 1939, by A. B. Groves; and notes on fruit diseases in the Ozark section of Missouri in 1939, by M. A. Smith.

No. 3.—Distribution and hosts of cedar blight (*Phomopsis juniperovora*) in the United States, and reports of cedar blight in 1939, both by G. G. Hahn; *Phomopsis gardeniae* in relation to gardenia culture, by M. A. McKenzie, L. H. Jones, and C. J. Gilgut; *Verticillium* wilt of Laurestinus, by J. A. Milbrath; Granville wilt of tobacco in Maryland, by E. A. Walker; control of *Cercospora* leaf spot of peanuts in Virginia, 1939, by L. I. Miller; nematode injury to potatoes in California, by J. T. Middleton; brown patch on St. Augustine grass, by A. A. Dunlap and W. N. Ezekiel; and prolonged January cold causes heavy damage in the South.

[Studies of plant diseases by the Colorado Station] (*Colorado Sta. Rpt. 1939, pp. 10–12, 16, 17, 18, 19, 27, 28, 32, 33*).—Progress reports are included on chlorosis of stone fruits, bacterial wilt and winter-killing in alfalfa, corn root rot and smut, *Phoma* pink root and *Fusarium* bulb rot of onions, tomato fruit rot (*Phytophthora capsici*), potato ring rot, symptomless carriers of peach mosaic, *Fusarium* disease of carnations, bacterial wilt of potatoes, and foot rots of pod peas.

[Plant disease studies by the Georgia Station]. (Partly coop. Ga. Coastal Plain Expt. Sta. et al.). (*Georgia Sta. Rpt. 1939, pp. 19, 21–26, 27, 60, 61, 61–64*).—Progress is briefly reported on the following: Cotton wilt-potash studies; breeding and selection for wilt resistance in cotton; distribution and control of the meadow nematode *Pratylenchus pratensis;* the effect of locations on seed-borne organisms, germination, and field stand in cottonseed; cotton seedling disease survey, 1939; cottonseed treatment; *Cercospora* leaf spot of peanuts; resistance of pepper to *Sclerotium rolfsii* blight; overwintering of *Macrosporium solani* in the soil in relation to tomato infection; watermelon wilt resistance; winter injury to peach trees; resistance of snap beans to root rot; and diseases of Austrian winter peas and vetches.

Botany and plant pathology section. (Partly coop. U. S. D. A.). (*Iowa Sta. Rpt. 1939, pt. 1, pp. 99–107, 109–115, 116–118, figs. 2*).—Progress reports are included on breeding and selection of better wilt- and anthracnose-resistant strains of watermelon and on the cause of watermelon stand failures, by S. G.

Younkin and I. E. Melhus; parasitism of smuts, rusts, and minor diseases of oats, by H. C. Murphy; development of disease-resistant oat strains, by Murphy and L. C. Burnett; control of seed- and soil-borne potato diseases, by C. S. Reddy; pathogenicity, host response, and control of *Cercospora* leaf spot of sugar beets, by E. L. Waldee; propagation of disease-free sweetpotato seed stock, by Melhus; yellow dwarf and other onion diseases in Iowa, by G. Semeniuk and Melhus; three apple diseases in Iowa—cedar apple rust, apple scab, and root necrosis, by G. C. Kent and Melhus; plant pathology phases of barley breeding, especially for scab resistance, by Reddy; influence of pythiaceous and other fungi on seedling stands of legumes and other crops, by Melhus, Reddy, W. F. Buchholtz, and Murphy; sugar production and storage in the sugar beet and development of strains suitable to Iowa conditions and methods of seed production, including disease relations, by Melhus, Reddy, Buchholtz, and Waldee; identification and control of diseases of small ornamentals and fruit tree stocks in Iowa nurseries, by Kent and Melhus; biology and control of nursery diseases of plants to be used in the prevention of soil erosion, by Melhus; and effect of seed treatments on diseases causing poor stands of flax in Iowa, by Reddy.

[**Phytopathological work by the Maryland Station**]. (Partly coop. U. S. D. A. et al.). (*Maryland Sta. Rpt. 1939, pp. 48–59, figs. 6*).—The present status is reported briefly for studies of the physiology of plant virus diseases, by H. G. du Buy; dissemination and control of the raspberry streak disease; breeding of *Fusarium* wilt-resistant cantaloups; apple scab and fruit spraying and storage studies with respect to scab; tobacco varieties resistant to *Fusarium* wilt; disease resistance in peas; strawberry root diseases, with especial reference to the *Phytophthora*-induced red stele disease; potato seed improvement and disease control; and the finding and development of potato strains resistant to diseases.

[**Plant pathology studies by the Cornell Station**]. (*Partly coop. U. S. D. A. et al.*). (*[New York] Cornell Sta. Rpt. 1939, pp. 148–157*).—The following are briefly reported upon by various members of the staff, M. F. Barrus, H. H. Whetzel, K. D. Butler, F. M. Blodgett, E. N. McCubbin, C. S. Tuthill, K. B. Nash, W. M. Epps, J. B. Skaptason, L. C. Peterson, A. B. Burrell, F. H. Lewis, W. H. Burkholder, A. W. Dimock, C. Chupp, H. M. Fitzpatrick, W. L. White, F. A. Haasis, F. Weiss, A. G. Newhall, M. W. Nixon, M. B. Linn, D. Reddick, W. R. Mills, D. S. Welch, K. G. Parker, and L. J. Tyler: A study of the control of rust and other leaf and stalk diseases of small grains by sulfur dust applications to the plants; the relation of agronomic practices to the incidence of scab and rhizoctonosis in potatoes; factors influencing the efficiency of potato spraying; *Fusarium* wilt and tuber rot of potatoes; cork, drought spot, dieback, and rosette of apple; field testing of fungicides for control of apple scab; the nomenclature, classification, and physiology of bacterial plant pathogens; bacterial diseases of plants and their pathogens; control of diseases of miscellaneous ornamentals grown under glass; control of club root of cabbage and cauliflower; taxonomic and life-history studies in the *Discomycetes*; basal rot of narcissus; a study of soil pasteurization; lettuce yellows and other virus diseases; studies on physiogenic diseases of celery; control of onion smut; permanent crop improvement through control of disease by developing immune or disease-resistant stocks; and Dutch elm disease investigations

The architecture of viruses, W. M. Stanley (*Physiol. Rev., 19 (1939), No. 4, pp. 524–556*).—In this monographic review (111 references) the author takes up the history and present status of the subject, discussing viruses under such headings as virus activity—its measurement; correlation of virus activity with

chemical and physical properties; composition; crystallinity and its significance; size and shape; and the nature and mode of action of viruses.

The sexual behaviour of several plant rusts, A. M. BROWN (*Canad. Jour. Res., 18 (1940), No. 1, Sect. C, pp. 18–25, pls. 3*).—Greenhouse tests indicated *Uromyces trifolii hybridi*, *U. fabae*, and *Phragmidium speciosum* to be heterothallic. All of them produced well-developed pycnia, and one of them (*U. fabae*) may shorten its cycle by omitting aecia or may produce uredia and aecia in association. By similar tests it was found that *Puccinia coronata elaeagni*, *P. grindeliae*, and *P. xanthii* are homothallic, and the homothallism of *P. malvacearum* was confirmed. In all these rusts, single sporidia give rise spontaneously to binucleate infections. *P. malvacearum*, *P. xanthii*, and *P. grindeliae* (usually) lack pycnia, whereas *P. coronata elaeagni*, a species described as without pycnia, was shown to produce them occasionally. There are 23 references.

New species of Gymnosporangium, I. H. CROWELL (*Canad. Jour. Res., 18 (1940), No. 1, Sect. C, pp. 10–12, figs. 3*).—*G. minus* n. sp. is reported from *Cupressus sempervirens* near Athens, Greece, and is said to be the only species on a non-*Juniperus* host in Europe. *G. guatemalianum* n. sp. on *Amelanchier nervosa* and *G. meridissimum* n. sp. on *C. benthami* in Guatemala are said to be the most southerly species of the genus and possibly related genetically.

The genus Massariovalsa, L. E. WEHMEYER (*Amer. Jour. Bot., 26 (1939), No. 10, pp. 831–834, figs. 9*).—Cultural studies of the one good species of this genus, *M. sudans*, from *Acer*, *Carya*, and *Nyssa* indicated certain differences considered to be of varietal rank. The fungus strains from *Acer* and *Carya* produced a conidial stage identical with *Melanconiopsis inquinans*, while the one from *Nyssa* produced numerous perithecia but no conidia. *Massariovalsa* is considered as a subgenus of *Melanconis*.

Factors influencing attenuation of Phytomonas stewarti cultures, G. L. MCNEW (*Jour. Bact., 39 (1940), No. 2, pp. 171–186, figs. 2*).—It was found that highly virulent cultures of *P. stewartii* became less virulent by a series of steps, the first observable change being the appearance of a variant of mediocre virulence. This strain became predominant but usually failed to replace completely the virulent parent type. Finally, slightly virulent strains developed and under some conditions became dominant. Cultures on synthetic agar or broth or in peptone-dextrose broth lost much of their virulence after 31 serial transfers, containing practically none of the highly virulent type of cells and very few of the intermediate. Cultures maintained in nutrient-dextrose agar or broth or peptone broth for the same period were fully virulent even though containing some weakly virulent strains. Nutrient-dextrose broth cultures incubated at 16° C. contained the same types of strains and in about the same proportions as those incubated at 26°, but those grown at 36° were considerably attenuated. The last contained weakly virulent strains as the predominating type, many slightly virulent ones, and practically none of the highly virulent parent type. Cultures in nutrient-dextrose broth lost more of the virulent parent type when maintained without transfer than when transferred to fresh broth regularly. The weakly virulent strains predominated in the aged culture. Almost avirulent strains were isolated from the culture after 34 days.

Studies in the genus Typhula, R. E. REMSBERG (*Mycologia, 32 (1940), No. 1, pp. 52–96, figs. 58*).—This is a monographic account (41 references) of the fungus genus *Typhula*, containing species pathogenic to cereals and grasses as well as to other plants, involving cultural, morphological, and taxonomic studies, with a key to the species, nine of which are described as new.

Three bacterioses of Argentina: Erwinia carotovora on cabbage and pepper, Phytomonas campestris on cabbage, and P. vesicatoria on tomato [trans. title], L. HALPERIN and L. S. SPAINI (*Rev. Argentina Agron., 6 (1939),*

No. 4, pp. 261–275, pls. 4; Eng. abs., p. 273).—The symptoms and morbid anatomy of the diseases and the causal organisms are described, and their importance and distribution in Argentina are discussed. There are 43 literature references.

The configuration of glutamic and aspartic acids from pathogenic bacteria (Phytomonas tumefaciens and Corynebacterium diphtheriae), E. CHARGAFF (*Jour. Biol. Chem., 130 (1939), No. 1, pp. 29–35*).—"Glutamic and aspartic acids were isolated from *P. tumefaciens*, the etiological agent of plant tumors, and from *C. diphtheriae*. The amino acids were found to have the normal *l*(+) configuration."

Detection and classification of seed-borne organisms, their effect on germination and their control by seed disinfection in laboratory and field, R. H. PORTER. (Iowa Expt. Sta.). (*Assoc. Off. Seed Anal. North Amer. Proc., 30 (1938), pp. 195–215*).—It is concluded from this study that the effect of seed disinfectants on germination in laboratory soil or sand and to some extent in blotters is reasonably indicative of what would occur in the field. Seedling blights of corn, sorghum, and small grains, and seed rots of peas and lima beans were partly or completely controlled by proper seed treatment. Ethyl mercury preparations of proper strength were satisfactory disinfectants for barley, corn, lima beans, oats, sorghum, and wheat, both in field and laboratory, controlling parasitic organisms and effectively checking saprophytes which might interfere with laboratory tests. Sand or soil plus sand, autoclaved at 15 lb. pressure, provides a laboratory medium said to be superior to blotters for germinating barley, lima beans, oats, peas, sorghum, and wheat, and to measure the effect of seed disinfectants on germination. Dry treatments are deemed preferable to liquids for both field and laboratory use, due to ease of application and later storage, ease of handling with vacuum or other seed counters, and presence of a residue affording protection against soil fungi. The detection of seed-borne organisms is facilitated by placing seeds on moist blotters with spaces between the seeds to prevent rapid spread of fungi. Mercury poisoning was found less liable to occur in seeds germinated in sand or soil than in blotters or towels. Seed laboratory reports giving the germination of treated and untreated seeds are considered valuable aids in establishing seed treatment as an agricultural practice.

An analysis of factors causing variation in spore germination tests of fungicides.—I, Methods of obtaining spores, S. E. A. MCCALLAN and F. WILCOXON (*Contrib. Boyce Thompson Inst., 11 (1939), No. 1, pt. 1, pp. 5–20, fig. 1*).—Using the slide-moist chamber technic, the authors studied the germination of ±400,000 conidia of *Sclerotinia fructicola* (from 7-day cultures on potato-dextrose-agar slants) in $CuSO_4$ solutions. The conidia were developed and germinated mostly in a specially designed constant temperature room at 21° ± 0.5° C. Spores from replicated transfers varied much more than expected from random sampling, but replicate counts on spores from the same transfer varied no more than random sampling. This variation was not due to differences in size of test tubes, tightness of cotton plugs, or of inoculum consisting of spores or of mycelium. By improving the technic a 15–20-fold reduction was effected in the variation of replicate transfers, making it comparable to the unavoidable error of random sampling. This technic consisted of adding distilled water to the culture tube, lightly rubbing the spores off with a rubber policeman, filtering the spore suspension through cheesecloth, centrifuging, and decanting the supernatant liquid containing water-soluble nutrients from the slants which were responsible for the variation. Detailed comparisons of mass-spore isolates from several localities and of single-spore isolates from them showed no consistent differences among the various mass or single-spore isolates as to variability of replicate transfers or response to

given concentrations of copper. Even with the improved technic there remained a significant variation between similar tests repeated at different times, possibly due in part to the necessity of using different batches of agar for spore production. Until the variation of replicate tests, due to different lots of spores, can be reduced, the criterion for comparing fungicides must be the consistency of their differences in repeated tests.

Toxicity of allyl isothiocyanate vapor to certain fungi, D. E. Pryor, J. C. Walker, and M. A. Stahmann. (Univ. Wis. and U. S. D. A.). (*Amer. Jour. Bot., 27 (1940), No. 1, pp. 30–38, figs. 3*).—The toxicity of allyl isothiocyanate vapor in equilibrium with its solution to *Colletotrichum circinans*, *Gibberella saubinetii*, *Aspergillus alliaceus*, and *A. niger* was found to depend on the concentration and amount of mustard oil in the solution. Above a definite vapor phase concentration, growth of these fungi in a closed system was inhibited provided sufficient mustard oil was potentially available in the solution to maintain this inhibitory vapor phase concentration. At lower concentrations, growth was not inhibited even though the amount of potentially available mustard oil in solution was many times that which would inhibit growth at a slightly higher concentration, indicating that the cumulative effect reported for certain metallic ions apparently does not occur with this substance. When older thalli were used, more isothiocyanate was required to prevent colony increase. During the 72 hr. allowed for spore germination and mycelium development, *C. circinans* and *A. alliaceus* rapidly became more resistant to the oil, whereas *G. saubinetii* and *A. niger* became only slightly more tolerant. Spores varied more in tolerance than mycelium. The average amount of isothiocyanate necessary to prevent colony appearance from spores of *C. circinans* and *G. saubinetii* was less than that which stopped colony enlargement, with *A. alliaceus* the amount varied with age of mycelium at time of exposure, while with *A. niger* about the same amount (or slightly more) was required to inhibit colony appearance as for mycelial growth. Colonies of the first two species were generally killed at the point where growth stopped, while from two to four times the inhibitory amount was necessary to kill the last two. The smaller the spore load the smaller was the amount of toxic material required to prevent germination.

Spray injury studies: Progress report I.—Some observations on the probable causes of lime-sulphur injury, W. E. Berry (*Univ. Bristol. Agr. and Hort. Res. Sta., Long Ashton. Ann. Rpt., 1938, pp. 124–144, pl. 1*).—The symptoms of lime-sulfur injury are described, and a list is presented showing the relative susceptibilities of some varieties of apples, pears, plums, and small fruits to it. The penetration of spray materials into the leaf is discussed, with particular reference to cuticle permeability and the effect of nutritional and climatic factors. In one experiment maximum injury occurred when the temperature was high, humidity low, and sunshine continuous. It is concluded that loss of water due to the purely osmotic effect of spray deposit is not alone responsible for injury. Necrotic patches are believed to result from local penetration of spray fluid, but the increase in respiration is apparently due to a more general physiological effect on the whole leaf. Possible causes of the effects observed are discussed, and it is suggested that injury of the type resulting in leaf abscission is due to a gaseous or volatile compound, probably H_2S.

The control of damping-off fungi by means of chemicals applied to the soil, with special reference to weak formaldehyde solutions, L. Ogilvie, C. J. Hickman, and H. E. Croxall (*Univ. Bristol. Agr. and Hort. Res. Sta., Long Ashton, Ann. Rpt., 1938, pp. 98–114*).—The tests reported indicate that of the large number of chemicals tried, formaldehyde is most efficient as a soil fungicide against the fugi causing damping-off, and that if used in dilutions of

1-200 to 1-600 for watering seed boxes after the seed has been sown it controls these fungi to a marked extent. The method was successfully used with seeds of peas, tomatoes, cucumbers, and sweet peas, but appeared to reduce emergence of stocks and certain other ornamentals.

Effects of plant and animal hormones on seeds damaged by formaldehyde, N. H. GRACE (*Canad. Jour. Res., 17 (1939), No. 12, Sect. C, pp. 445–451*).—Marquis wheat was immersed in solutions of formaldehyde and formaldehyde containing either naphthylacetic acid or oestriol at concentrations of 0.1, 1, 5, and 10 p. p. m., and germinated on blotting paper or grown in soil at 70°–75° F. A measure of physiological activity (and of the same order) was shown by both hormones in the blotting paper tests, but growth in soil failed to show anything but injurious effects from the formaldehyde. In another test, the wheat was sprinkled with solutions of formaldehyde and indolylacetic acid and grown in soil at 50°–55°. Supplying in this way one part of formaldehyde per million parts of wheat by weight, the formaldehyde injury was reduced in a statistically significant manner, but lower concentrations failed to better these results appreciably.

A third species of Mastigosporium on gramineae, R. SPRAGUE. (U. S. D. A. and Oreg. Expt. Sta.). (*Mycologia, 32 (1940), No. 1, pp. 43–45, fig. 1*).—*M. cylindricum* n. sp. is described from living leaves of *Bromus vulgaris*, and *M. rubricosum* n. comb. replaces *M. calvum*.

A comprehensive study on symptoms of abacá mosaic, M. R. CALINISAN (*Philippine Jour. Agr., 10 (1939), No. 2, pp. 121–130, pls. 9*).—The author presents a detailed account of the symptoms of this virus disease of abacá in Davao, including those on the leaves, midribs, petioles, pseudostem, inflorescence, and fruits.

Disease-free seed and rotation check bacterial blight, O. A. REINKING (*Farm Res. [New York State Sta.] 6 (1940), No. 1, pp. 6, 8, fig. 1*).—Data for 1939 from commercial fields and replicated experimental plats, using the common mosaic-resistant Idaho Refugee and U. S. No. 5 and the mosaic-susceptible Stringless Green Refugee beans, appear to indicate that with seed free of the organisms of both common bacterial and halo blights on land not in beans for at least 1 yr., injury from these blights is kept at a minimum and excellent commercial yields should be obtained. Stringless Green Refugee proved somewhat more resistant to blight than the other two varieties, while the situation for mosaic strongly favored the two mosaic-resistant varieties as in previous tests.

Chemical control of molds when germinating lima beans, W. CROSIER and C. NELSON. (N. Y. State Expt. Sta.). (*Assoc. Off. Seed Anal. North Amer. Proc., 30 (1938), pp. 189–194*).—On the whole, the mercury compounds proved the most successful as well as the easiest to apply of the materials tested. The copper compounds often failed to provide uniform coverings and were markedly phytotoxic, while $(NH_4)_2SO_4$, $FeSO_4$, and $K_2Cr_2O_7$ are not recommended as seed protectants. Barbak C. Ceresan, $HgCl_2$, New Ceresan, and combinations containing the last reduced greatly or completely eliminated the micro-organisms.

On the use of chlorinated nitrobenzenes for the control of club root disease of Brassicae, M. J. SMIETON (*Jour. Pomol. and Hort. Sci., 17 (1939), No. 3, pp. 195–217*).—In seed-box tests, trichlorodinitrobenzene sometimes equaled $HgCl_2$ for control of *Plasmodiophora brassicae* and was superior to pentachloronitrobenzene. In outdoor seedbed trials (1.5–3 oz. per square yard) it gave a varying control, depending on the degree of soil contamination. Substantial control was also obtained by adding a small amount diluted with soil to the dibble hole at transplanting time. All the substances tested were liable to check

the growth of the plants. A method of dipping the roots in a wet mixture of fungicide with soil, previous to transplanting in general proved inferior to the standard dibble-hole method. Apart from the cost of application, promising results followed broadcasting the fungicide. The fungicidal and phytocidal effects of the two chlorinated preparations were found to depend materially on the particular filler used.

A rootstock canker of hops caused by Gibberella pulicaris (Fr.) Sacc., D. L. G. Davies (*Univ. Bristol, Agr. and Hort. Res. Sta., Long Ashton, Ann. Rpt., 1938, pp. 115–123, pls. 2*).—This reports serious injury in many hopyards in Worcestershire, England, in 1938, inoculations showing the canker to be due to *G. pulicaris*. The symptoms, causal organism, and mode of infection are discussed.

Lettuce drop due to Sclerotinia minor [trans. title], G. Goidànich (*Bol. R. Staz. Patol. Veg. [Roma], n. ser., 19 (1939), No. 3, pp. 293–334, pls. 2, figs. 14*).—This reports a general study of the disease, including its symptoms, destructiveness, and control in Italy, and of the causal fungus, including its life history, morphology, cultural behavior, pathogenicity, identification of the race to which the Italian strain belongs, and its spontaneous and artificially inoculated hosts.

A comparative study of American and European potato virus diseases, T. P. Dykstra. (U. S. D. A.). (*Amer. Potato Jour., 16 (1939), No. 11, pp. 281–287*).—As a result of the studies reported, it is concluded that paracrinkle and virus C are the only European forms not found in this country. Leaf rolling has not been reported from Europe. Although there was a slight difference among the "Y", vein banding, and stipple streak viruses, they are considered closely related strains of the same virus, and it is proposed that these strains be designated as virus Y. The same situation was found with regard to crinkle, crinkle mosaic, and mild mosaic, and it is suggested that the virus in addition to X causing these three diseases be designated as virus A.

Some characteristics of bacterial ring rot of potatoes, A. H. Eddins. (Fla. Expt. Sta.). (*Amer. Potato Jour., 16 (1939), No. 12, pp. 309–322, figs. 7*).—The resemblances and differences between the closely similar bacterial ring rot (*Phytomonas sepedonica*) and the brown rot or southern bacterial wilt (*P. solanacearum*) are discussed. Tubers infected with ring rot and held at different temperatures for 5 mo. developed the disease rapidly at 70°–95° F., less so at 60°–65°, and slowly at 37°. Samples of infected seed stock from Maine, grown at Hastings, Fla., exhibited an increase in ring rot as compared with the same stock in Maine. The disease was spread from contaminated cutting knives and hands, but did not affect potatoes grown in soil infested the preceding year. Losses at Hastings declined from 5 percent in 1937 to 0.5 percent in 1939 when most of the infected seed stocks had been eliminated as seed sources.

Station method of eliminating bacterial wilt from potato seed shows promise, C. H. Metzger and D. P. Glick (*Colo. Farm Bul. [Colorado Sta.], 2 (1940), No. 1, p. 13*).—Promising results are reported with use of the smear-stain test method for detecting the Gram-positive bacteria causing wilt, thus enabling affected material to be eliminated from seed stocks.

The effects of magnesium and calcium on "white tip" of rice, A. L. Martin. (Tex. Expt. Sta.). (*Amer. Jour. Bot., 26 (1939), No. 10, pp. 846–852, figs. 6*).—The injury to leaves of rice grown in soil and water cultures low in Mg content was similar to spontaneous chlorosis known as white tip, but was eliminated in soil cultures when 81 p. p. m. and in water cultures when 27 p. p. m. of Mg were added. However, these concentrations produced toxic effects, and normal plants were obtained only when Ca as well as Mg was supplied. Ca

was not toxic in low concentrations in the soil cultures, but in Mg-free water cultures 9 p. p. m. or more induced stunting and brown leaf spots, which were not evident when sufficient Mg had been added. The greatest benefit from the antagonistic action occurred with Mg : Ca ratios of 1 : 1 or 1 : 3 when Ca and Mg were present in concentrations of 27, 81, or 243 p. p. m. of each element.

A review of sugar cane diseases, C. W. CARPENTER (*Hawaii. Sugar Technol. Rpts., 2 (1939), pp. 33–37*).—The author discusses the six cane diseases deemed most important for Hawaii, viz, eyespot and brown stripe diseases, due, respectively, to the leaf-invading fungi *Helminthosporium sacchari* and *Cochliobolus stenospilus*, leaf scald, chlorotic streak, mosaic, and *Pythium* root rot. Quarantine and disease prevention and control are also considered briefly.

The tolerance of sugar cane varieties to the major diseases, J. P. MARTIN (*Hawaii. Sugar Technol. Rpts., 2 (1939), pp. 31, 32*).—Based on variety tests and field observations, the relative tolerance of 34 cane varieties is presented for eyespot, brown stripe, leaf scald, chlorotic streak, mosaic, and *Pythium* root rot.

Chlorotic streak, I. L. FORBES. (La. Expt. Sta.). (*Sugar Jour., 2 (1939), No. 7, p. 29*).—A progress report on this virus disease of sugarcane.

Blue mold (downy mildew) of tobacco and its control. (Coop. N. C. and S. C. Expt. Stas. et al.). (*Virginia Sta. Bul. 324 (1940), pp. 19, figs. 8*).—This is a compendium of information on the disease and its control.

The size of the tobacco mosaic particle from X-ray determinations, J. W. GOWEN. (Iowa State Col.). (*Natl. Acad. Sci. Proc., 26 (1940), No. 1, pp. 8–10, fig. 1*).—Data from the author's X-ray experiments agree in viewing this virus as a rather large molecule of 16–20 million in molecular weight. The large portion of this molecule is said to be important to its reproduction, leaving a smaller portion capable of change without affecting the power to reproduce.

Common diseases of tomatoes, P. A. YOUNG, A. L. HARRISON, and G. E. ALTSTATT (*Texas Sta. Cir. 86 (1940), pp. 32, figs. 16*).—This is a compendium of information on the following diseases and their control under Texas conditions: *Fusarium* wilt, southern blight, root knot, early blight, *Septoria lycopersici* blight, late blight, leaf mold, bacterial canker, bacterial spot or nailhead rust, mosaic, fern leaf, spotted wilt and tip blight, streak, curly top, witches' broom, psyllid yellows, soil rot, buckeye rot, sack and bacterial rot, *Rhizopus* rot, *Phoma* rot, core rot, blossom-end rot, puff, catface, failure to set fruit, sun injury, hail injury, water scald, and dodder.

Stem rust in 1938, E. C. STAKMAN and L. M. HAMILTON (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 1939, Sup. 117, pp. 69–83, figs. 3*).—Both stem rust and leaf rust are reported to have been epidemic on wheat in 1938. This survey discusses in detail the losses involved; overwintering and development of stem rust in Mexico and its possible overwintering in parts of Oklahoma; the spring development in the south and the northward migration; rust on barberries and its relation not only to spread on wheat but to the production and perpetuation of new and virulent rust races; slide exposures, including those indicating that stem rust spores were in the air as far north as Nebraska during eight periods each in May and June; rust development in the spring wheat area; and a survey of physiologic races, showing that in 1938 race 56 was primarily responsible for the epidemic and was for the fifth consecutive year the most prevalent race. Four other races were also fairly widely distributed. Collections on barberries for the most part yielded the wheat strain of rust. The races most commonly isolated are listed.

Histology of some physiological disorders of the apple fruit, M. MACARTHUR (*Canad. Jour. Res., 18 (1940), No. 1, Sect. C, pp. 26–34, pls. 2, fig. 1*).—"The histological similarities and differences between the boron-amenable disorders, internal cork, corky core, and drought spot, and the non-boron-amenable

disorder, bitter pit, are presented. Blotchy pit is discussed as a borderline type, since one end of a graded series is similar to internal cork and the other is indistinguishable from bitter pit. On the basis of histology water core is not placed in either of the two groups. Starch retention, in localized or diffuse necrotic areas, is common to both groups of disorders. External papillations occur on the walls of cells in close proximity to the lesions. Abnormal meristematic activities coexist with boron deficiency. There are (1) a cork cambium partially or completely walling off a lesion, (2) massed linear cells, heavily papillated, and (3) reactivated individual cells or groups of cells. All three types of abnormal cells may be present in internal cork and drought spot, but no cork cambium occurs in corky core."

Ground sprays as supplementary control for apple scab, D. H. PALMITER and J. M. HAMILTON *(Farm Res. [New York State Sta.], 6 (1940), No. 1, pp. 1, 4, figs. 2)*.—Experience has shown that lime-sulfur sprays will control scab but may be very injurious to both foliage and fruit, while wettable sulfurs, though usually causing no injury, cannot be depended upon when there is a heavy carry-over of inoculum under the trees. It is evident that lower concentrations and fewer sprays may be used if this carry-over of scab can be materially reduced. Promising results are reported with ground sprays applied to overwintering apple leaves before the spores discharge in spring, but further tests are needed before general commercial use of the method. In the 1939 tests the eradicant spray consisted of monocalcium arsenite, nitrate of soda, and Elgetol.

Results of the survey for "X" disease of the peach, F. A. SORACI *(N. J. State Hort. Soc. News, 20 (1939), No. 6, pp. 1157, 1163, fig. 1)*.—In a survey of the X-disease in 16 counties of New Jersey, no sign on peach trees in the choke-cherry area was found and only one possible instance in the wild host.

Historical records of avocado scab in Florida and Cuba, A. E. JENKINS. (U. S. D. A.). *(Calif. Avocado Assoc. Yearbook, 1939, pp. 76–78, figs. 2)*.

Citrus gummosis and its surgical and therapeutic treatment [trans. title], A. CONCEIÇÃO *(Univ. Nac. Tucumán. Inst. Invest. Agr., Pub. 251 (1939), pp. 91, [pls. 25, figs. 31])*.—A copiously illustrated handbook.

Manganese deficiency for citrus in California, E. R. PARKER, H. D. CHAPMAN, and R. W. SOUTHWICK. (Calif. Citrus Expt. Sta.). *(Science, 91 (1940), No. 2355, pp. 169, 170)*.—The responses to manganese treatments recently obtained on citrus trees in the Santa Clara River Valley, Calif., are reported to indicate a deficiency of this element for citrus in the area, and it is believed that the relations of this condition to premature decline of fruit trees may be important. The foliage symptoms are described, and previous work is briefly referred to.

Commercial control of citrus scab in Florida, G. D. RUEHLE and W. L. THOMPSON *(Florida Sta. Bul. 337 (1939), pp. 47, figs. 5)*.—The symptoms, cause (*Elsinoë fawcetti*), and contributing conditions are considered, and the results of field tests (6 yr.) are given regarding commercial control of scab and scale insects on grapefruit, tangelo, and King orange groves. Spraying just before the spring flush of growth is considered the best time for scab control. Applications in the last of the bloom also give good control, but this practice is not applicable to larger groves. Homemade bordeaux mixture (pulverized $CuSO_4$ and superfine hydrated lime) gave consistently good results, 6–6–100 being recommended for the pregrowth spray of severely infected overwintered foliage and 3–3–100 for new foliage with mild overwintered infection and for bloom and post-bloom sprays of fruit. When the overwintered foliage is but slightly infected, one pregrowth application of the stronger formula usually gave adequate protection. Some of the proprietary copper sprays gave equally good control at approximately equal copper content, and insecticides compatible with bordeaux were also satisfactory with them. Lime-sulfur (4–100) with added wettable

sulfur gave only partial control with moderate to severe infection and had little effect in reducing melanose blemish. Mercury-oil emulsions were unreliable with moderate or severe scab infection. Scale insects are more pronounced and difficult to control after bordeaux than after the proprietary insoluble coppers, but may be very marked after any copper spray unless scalecides are used. Oil emulsion (1 percent of oil) or wettable sulfur (5–10 lb. to 100 gal.) should be combined with the pregrowth copper spray, the former being preferable, especially with red scale abundant. Between late May and July 1, oil emulsion (1¼–1⅔ percent actual oil) should again be applied for scale. Early infestation of rust mites on young trees was readily controlled by wettable sulfur at 5–6 lb. to 100 gal. of the bloom or post-bloom sprays. In older trees with both scab and melanose two sprayings with copper fungicides are necessary for effective control.

Biological control and ecology of Armillaria mellea (Vahl) Fr., R. Leach (*Brit. Mycol. Soc. Trans., 23 (1939), pt. 4, pp. 320–329, pls. 2*).—Problems of controlling *Armillaria* root disease in young and old plantation crops are discussed, with special reference to tea in Nyasaland, and a method is suggested for curtailing the normal course in young plantations. The basic control consists in preventing infection of the remaining roots of forest trees after clearing the land. Ringbarking is considered the best method of biological control, and observations and experiments described support this conclusion. The ecology of *A. mellea* is discussed. A test indicated that nearly all indigenous trees could be invaded, though the roots of only a few species are commonly associated with *Armillaria* root disease of tea. The roots of most species are able normally to localize infection, but when the roots are severed the fungus travels freely. The rate at which tree roots die after felling is believed to be the factor controlling the distribution of *Armillaria* in cleared forests, roots dying slowly facilitating the spread of the fungus.

Certain nuclear phenomena in Albugo portulacae, R. B. Stevens. (Univ. Wis.). (*Mycologia, 32 (1940), No. 1, pp. 46–51, figs. 8*).—A cytological study of the resting and dividing nucleus of this parasitic fungus on *Portulaca oleracea*.

[Tree diseases] (*East. Shade Tree Conf., New York, 1939, Proc., pp. 58–67, 95–99*).—The following papers are of interest to phytopathology: Dutch Elm Disease Control in New York State, by W. H. Rankin; Dutch Elm Disease Eradication Work in New Jersey, by E. G. Rex; The Dutch Elm Disease Situation in Connecticut, by W. O. Filley (Conn. [New Haven] Expt. Sta.); and Breeding Trees for Disease Resistance, by A. H. Graves.

A new species of Dothiora on aspen and willow, C. L. Shear and R. W. Davidson. (U. S. D. A.). (*Mycologia, 32 (1940), No. 1, pp. 105–111, figs. 3*).—*D. polyspora* n. sp., believed to be a weak parasite, is described.

Three Pezicula species occurring on Alnus, J. W. Groves (*Mycologia, 32 (1940), No. 1, pp. 112–123, figs. 12*).—*P. alnicola* n. sp. on twigs and branches of *A. incana* is included.

Sclerotinia bifrons, H. H. Whetzel. (Cornell Univ.). (*Mycologia, 32 (1940), No. 1, pp. 124–127*).—The author discusses the history and taxonomy of the eastern and western apothecial stages of a sclerotium infection of *Populus tremuloides* which are believed to differ specifically but which have appeared under the same name, *S. bifrons*. The author presents technical descriptions of *S. bifrons* n. sp. and *S. confundens* n. sp. for the eastern and western forms, respectively. In an appended editor's note, F. J. Seaver proposes that the name *S. whetzelii* (Syn. *S. bifrons* Whetzel 1940, not *S. bifrons* Seaver and Shope 1930), be adopted to replace the later homonym to avoid confusing the two forms, and promises a detailed account of the western species at a later time.

Blister rust control in the Inland Empire, H. E. SWANSON. (U. S. D. A.). (*Jour. Forestry, 37 (1939), No. 11, pp. 849–852*).—Because of the size of the task and the inaccessibility of many of the western pine and sugar pine stands, the control of white pine blister rust in the West appeared to be almost impossible, but the progress made to date is said to be amazing and with adequate support capable of completion. The history of this work, the types of stand encountered, and the progress made are discussed.

Railroad tie decay. (U. S. D. A.). (*Washington, D. C.: Amer. Wood-Preservers' Assoc., 1939, pp. 55, pls. 25*).—In this handbook, The Decay of Ties in Storage, by C. J. Humphrey (pp. 4–26), considers general questions, including the conditions necessary for growth of the fungi concerned and control in stored ties, and then briefly describes some 25 species, with a key to their identification. The second paper, Defects in Cross Ties Caused by Fungi, by C. A. Richards (pp. 27–54), discusses decay in wood due to fungi, types of fungi concerned, how they get into wood, kinds of rots, heartwood rots in living coniferous and hardwood trees, and various rots of ties. Though difficult to detect, the incipient stages are especially important to discover. Fungi infecting living trees may continue growth in the ties, and in some localities other fungi enter the ties shortly after they are cut and act on them very rapidly.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Nomenclator zoologicus.—Vol. I, A–C, edited by S. A. NEAVE (*London: Zool. Soc. London, 1939, vol. 1, pp. XIV+957*).—This is the first of four volumes projected to give as complete a record as possible of the bibliographical origins of the name of every genus or subgenus in zoology that has been published from 1758 (the date of the tenth edition of Linnaeus' Systema Naturae) to the end of 1935. Only the original reference is given except in a small proportion of cases, where a second or even a third is included. It does not contain names in works that have been excluded by the International Commission on Zoological Nomenclature, nor does it include clearly hypothetical ones.

Apparatus for measuring metabolism and activity in wild animals, W. H. LONG (*Mich. Univ., School Forestry and Conserv. Cir. 5 (1939), pp. 35, figs. 5*).—A respiration apparatus devised by the author is described, and methods of measuring metabolism, including the oxygen meter, spirometer, respiration chamber, cage and activity recorder, and weighing device, are considered. The new apparatus may be used for either open-circuit or closed-circuit measurement of the metabolism of small animals. A list of 36 references to the literature is included.

Hart Mountain antelope refuge, S. G. JEWETT (*U. S. Dept. Agr., Misc. Pub. 355 (1939), pp. [2]+25, figs. 24*).—In this contribution relating to the Hart Mountain antelope refuge in southeastern Oregon, which was established in December 1936 and embraces an area of 215,516 acres, the author deals with its history, topography, life zones, mammals, and birds and presents tourist information and an account of other areas maintained primarily for big-game animals. While the refuge was developed primarily to preserve the species for which it is named, it also serves as a haven for a variety of mammals, birds, and other forms of wildlife.

Utah's mule deer studies and management problems, D. I. RASMUSSEN. (Utah State Col. et al.). (*Amer. Wildlife, 28 (1939), No. 5, pp. 232–240, figs. 6*).

The quadrat method of studying small mammal populations, B. P. BOLE, JR. (*Cleveland Mus. Nat. Hist., Sci. Pubs., 5 (1939), No. 4, pp. 15–77, figs. 3.*)—A study of the yields of small mammals obtained from several sizes of trapping quadrats over a period of 8 yr. has led to the conclusion that this method provides an accurate means of determining small mammal abundances. Details of this

vestigation, which includes a comparison of the yields of different sizes and types of quadrats, are presented in part in 14 tables, and a list is given of 29 references to the literature.

Critical notes on the Texas beaver, W. B. Davis (*Jour. Mammal., 21 (1940), No. 1, pp. 84–86, figs. 2*).

Activity and food consumption in Microtus and Peromyscus, D. M. Hatfield (Minn. Expt. Sta.). (*Jour. Mammal., 21 (1940), No. 1, pp. 29–36, figs. 3*).—The study reported relates to meadow mice of the species *M. pennsylvanicus* and white-footed mice of the species *P. maniculatus*.

A study of local size variations in the prairie pocket-gopher Geomys bursarius, with description of a new subspecies from Nebraska, M. H. Swenk (*Missouri Val. Fauna, No. 1 (1939), pp. 8*).

A study of subspecific variation in the yellow pocket-gopher Geomys lutescens in Nebraska and of the geographical and ecological distribution of the variants, M. H. Swenk (*Missouri Val. Fauna, No. 2 (1940), pp. 12*).

Differentiation of eggs of various genera of nematodes parasitic in domestic ruminants in the United States, D. A. Shorb (*U. S. Dept. Agr., Tech. Bul. 694 (1939), pp. 11, figs. 2*).—Illustrations of the eggs of the various genera of nematodes parasitic in domestic ruminants in the United States, descriptive data presented in table form, and a key for the separation of the eggs of such nematodes, which represent 15 genera studied, are included in this contribution. It was found that the eggs of these species may be distinguished from one another when fresh feces are examined. The criteria for differentiation are size, shape, characteristics of shell, thickness of shell, pigment in cells, and stage of development. A discussion of the morphology of the egg is included. Nine references to literature cited are listed.

Studies on the endoparasitic fauna of Trinidad mammals.—VI, Parasites of edentates, T. W. M. Cameron (*Canad. Jour. Res., 17 (1939), No. 12, Sect. D, pp. 249–264, figs. 38*).—This continuation of the series (E. S. R., 77, p. 655) treats of the internal parasites from two species of anteaters and an armadillo from Trinidad, British West Indies. Five species are described as new to science.

Duck brood counts in Iowa during the summer of 1935, B. V. Travis. (Iowa Expt. Sta., U. S. D. A., et al.). (*Iowa Bird Life, 9 (1939), No. 4, pp. 46–50, figs. 3*).

Heath hen of the South, V. W. Lehmann. (Tex. A. and M. Col., U. S. D. A., et al.). (*Amer. Wildlife, 28 (1939), No. 5, pp. 221–227, figs. 2*).—This contribution relates to the Attwater prairie chicken (*Tympanuchus cupido*), or the heath hen of the South, which is so closely related to the heath hen of the North, now extinct, that both have the same generic and specific names. The Attwater prairie chicken is almost extinct in Louisiana, and only approximately 8,711 remained in Texas in 1937.

Pheasant propagation hand book (*Madison: Wis. Conserv. Comn., 1939, pp. 45, figs. 39*).—A practical handbook on the rearing of pheasants in Wisconsin.

Method for obtaining eggs and larvae of Nematodirus spp. for experimental purposes, G. P. Kauzal (*Jour. Council Sci. and Indus. Res. [Austral.], 12 (1939), No. 4, pp. 339–341*).—A description is given of the technic of a method suitable for collection of eggs of *Nematodirus* for experimental purposes. It is said to be an adaptation of Sheather's well-known sugar flotation technic. By its use continuous supplies of infective larvae of *Nematodirus* can be procured, free from other living nematode larvae, without much effort.

Insects in the upper air, A. D. Imms (*Nature [London], 144 (1939), No. 3644, pp. 406, 407*).

[Work in entomology by the Colorado Station] (*Colorado Sta. Rpt. 1939, pp. 23–27, 28, 29*).—A brief report is made of the work of the year (E. S. R., 80,

zona Bat "Caves", by C. B. Philip (pp. 15, 16); *Hypoderma* Myiasis in the Horse—Summary of a Series of Cases Studied During Spring and Summer, 1939, by D. W. Baker and W. S. Monlux (p. 16); A Study of Winter Activities and Hibernation of *Anopheles quadrimaculatus* in the Tennessee Valley, by E. H. Hinman and H. S. Hurlbut (p. 16); Segmentation in the Internal Organs in Infections With a Mexican Strain of *Plasmodium relictum*, by R. Hewitt (pp. 16, 17); On the Development of *Nosema bombycis* in the Fall Webworm (*Hyphantria cunea*), by R. R. Kudo and J. D. de Coursey (p. 17) (Univ. Ill.); The Burrowing Owl as a Host to the Argasid Tick *Ornithodoros parkeri*, by W. L. Jellison (p. 17); Siphonaptera—A Study of the Species Infesting Wild Hares and Rabbits of North America North of Mexico, by G. M. Kohls (pp. 17, 18); The Life History of *Stichorchis subtriquetrus* (Trematoda: Paramphistomidae), by H. J. Bennett and A. G. Humes (p. 18) (La. State Univ.); Life History Studies on Monostomes of the Genus *Notocotylus* (Trematoda), by E. C. Herber (pp. 18, 19); The Life Cycle of *Euparyphium melis* (Trematoda: Echinostomidae), by P. C. Beaver (p. 19); Preliminary Investigations on the Life Cycle of a Cestode of the Mouse (*Mus musculus*), by R. C. Rendtorff (p. 20), and Further Studies on the Life Cycle of a Cestode From the Herring Gull, by L. J. Thomas (p. 20) (E. S. R., 81, p. 105) (both Univ. Ill.); A Method of Obtaining Clean Suspensions of Cysts of *Endamoeba histolytica* From Culture, by H. E. Meleney and T. L. Snyder (p. 21); *Dioctophyme renale*, the Giant Kidney Worm Occurring in Mink, From the Southern Counties of Michigan, by A. E. Woodhead and C. W. McNeil (p. 23); Effect of Age of Rat on the Size of *Trichinella* Infections, by E. H. Marchant (p. 23); Sex Ratio of *Trichinella spiralis* From the Digestive Tract of Rats, by O. F. Gursch (pp. 23, 24); Recovery of *Trichinella spiralis* Larvae From Early Stages of Infection, by A. J. Levin (p. 24); *Diplostomum fosteri* n. sp. From a Panama Otter (*Lutra repanda* Goldman), by A. McIntosh (p. 25), and Experimental Infection of European Starling With *Leucochloridium carus*, by A. and G. E. McIntosh (pp. 25, 26) (both U. S. D. A.); Immunization of Birds to Malaria by Vaccination, by W. B. Redmond (pp. 28, 29); The Protective Action of Immune Serum Against *Plasmodium lophurae* in Chickens, by W. H. and L. G. Taliaferro (p. 29); The Reaction Between Hookworm (*Ancylostoma caninum*) Larvae and Immune Serum, by G. F. Otto (p. 29); On the Transmission of Immunity to *Trichinella spiralis* From Parent to Offspring, by E. A. Mauss (p. 29); Length of Life of Singly-Established *Strongyloides ratti*, by G. L. Graham (pp. 29, 30); On the Nature of Age Resistance to *Strongyloides ratti*, by H. J. Lawler (p. 30); The Intestinal Phase of the Immunity to *Cysticercus pisiformis* in Rabbits, by A. B. Leonard and A. E. Smith (pp. 30, 31); Immunity to Hookworm (*Bunostomum phlebotomum*) and Nodular Worm (*Oesophagostomum radiatum*) Infection in Calves, by R. L. Mayhew (p. 31) (La. State Univ.); Serological Reactions of Some Helminths, by R. W. Wilhelmi (p. 31); A New Record of Human Heartworm Infection From New Orleans, by E. C. Faust (p. 32); The Blood Picture of White Mice Infected With *Trichinella spiralis*, by G. W. Hunter, III, and V. Groupé (p. 33); The Penetration of Radioactive Phosphorus Into Encysted *Trichinella* Larvae, by O. R. McCoy and V. Downing (p. 33); A Practical Plan for the Control of Trichinosis, by T. C. Nelson (pp. 33, 34) (Rutgers Univ.); Progress Report on Pasture Rotation and the Prevalence of the Helminth Parasites of Sheep in Southwest Virginia, by W. L. Threlkeld (p. 34) (Va. Expt. Sta.); Phenothiazine as an Anthelmintic, by P. D. Harwood, R. T. Habermann, and L. E. Swanson (p. 34) (U. S. D. A.) (E. S. R., 81, p. 105); Changes Occurring in Blood of Chickens During Cecal Coccidiosis, by C. A. Herrick (pp. 34, 35) (Univ. Wis.); The Effect of Sulfapyridine on Experimental Avian Coccidiosis,

by P. P. Levine (p. 35) (E. S. R., 82, p. 108); *Capillaria* Infection of the Lower Digestive Tract of the Common Fowl (*Gallus domesticus*), by N. F. Morehouse (p. 35); Studies on the Bovine Blood Picture in Hookworm (*Bunostomum phlebotomum*) and Nodular Worm (*Oesophagostomum radiatum*) Infections, by E. T. Delaune and R. L. Mayhew (p. 36) (La. State Univ.); and Anthelmintic Efficacy of Unconditioned Crude Phenothiazine, by R. T. Habermann and P. D. Harwood (p. 36) (U. S. D. A.).

Review of United States patents relating to pest control, [January–December 1939], R. C. ROARK (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., Rev. U. S. Pat. Relat. Pest Control, 12 (1939), Nos. 1, pp. 9; 2, pp. 8; 3, pp. 10; 4, pp. 12; 5, pp. 13; 6, pp. 9; 7, pp. 9; 8, pp. 9; 9, pp. 9; 10, pp. 11; 11, pp. 8; 12, pp. 9*).—A continuation of this series (E. S. R., 81, p. 242).

Description of an insect container for a traplight, C. H. MARTIN. (Ohio Expt. Sta.). (*Bul. Brooklyn Ent. Soc., 34 (1939), No. 5, pp. 255–257, fig. 1*).

The trend of progress—insecticides, J. T. MARTIN and F. TATTERSFIELD (*Soc. Chem. Indus. [London], Chem. and Indus., 58 (1939), No. 27, pp. 635–640*).—A contribution from the Rothamsted Experimental Station to a symposium, presented with a list of 50 references to the literature.

Resistance to insecticides: The effect of knockdown and light doses on the resistance of houseflies to pyrethrum sprays, E. R. McGOVRAN, W. N. SULLIVAN, and G. L. PHILLIPS. (U. S. D. A.). (*Soap, 15 (1939), No. 8, pp. 88–90*).—In the work reported, houseflies that had been paralyzed with ether, acetone, or kerosene sprays low in pyrethrin content (0.5 mg. per cubic centimeter) were found to be more resistant to kerosene sprays high in pyrethrin content (2 or 4 mg. per cubic centimeter) than were normal active flies.

The problem of wallpaper staining by insecticides and insecticide bases, W. R. HUSEN (*Pests, 8 (1940), No. 1, pp. 14–16, figs. 6*).

***The rôle of surface tension and contact angle in the performance of* spray liquids,** W. EBELING (*Hilgardia [California Sta.], 12 (1939), No. 11, pp. 665–698, figs. 9*).—The microprojection of liquid drops by the apparatus and in the way here described is considered to make possible a simpler and more rapid means for the determination of the static contact angle than methods hitherto employed. This method involves the projection of a drop of liquid resting on a perfectly horizontal substratum and the tracing of the projected image. The microprojector built for material mounted on microscope slides was adapted, after minor adjustments, for the purpose of projecting liquid drop outlines. The outlines of drops 5 mm. in diameter were found to be elliptical but were practically circular for liquids with contact angles less than 65°. Smaller drops retain a spherical shape at even higher contact angles. The contact angles may be derived by differentiation of the equation of the drop outline. If the drop is a segment of a sphere, a more simple method may be employed for calculation of the contact angle. It is shown statistically that five measurements of the contact angle of a given liquid are sufficient to establish a highly significant mean and that a difference as low as 3°32′ can be reliably determined. Size of drop had no significant effect on contact angle. The nature of the substratum was found to have a great influence on the contact angle liquid/solid. Thus, leaves of different plant species, leaves of different ages on the same plant, and different sides or portions of a single leaf cause variation in the contact angle of a given liquid. A great difference in the contact angle of oil on leaf wax and oil on the wax of scale insects was found, the former being the greater.

Various solutes were tested with reference to their effect in lowering the contact angle of water and oil on various solids. The relative spreading ability of solutions of one substratum does not necessarily indicate their relative spread-

ing ability on other substrata. Thus Vatsol OT was found to be a more effective spreader per unit concentration than sodium oleate on *Viburnum* leaves but less effective on beeswax.

According to the formula for rate and distance of penetration of liquids in capillary tubes, a reduction of the surface tension and consequently of the contact angle of a liquid may increase its penetrativity into tubes on the inner surface of which it has a high contact angle, but reduces its penetrativity in tubes on the inner surface of which it has a very low or zero contact angle. This principle was experimentally verified with aqueous solutions in chemically clean glass tubes as contrasted to waxed glass tubes. The practical application of the principle is that by a reduction of surface tension the rate of penetration of aqueous solutions into porous solids such as bark, on which the solutions have a very low contact angle, may be decreased, and their rate of penetration through the waxy threads exuded by insects, or under their bodies and into their spiracles, may be increased. Consequently the usual great differences in the rate of penetration of the solutions into insects and their substrata, if they happen to be located on porous bark, is reduced.

The surface tension of water may be sufficiently reduced by the addition of some of the more effective wetting agents so that toxic aqueous solutions can penetrate under the body of the California red scale and cause the death of the insect. The percentage of mortality of the California red scale from a given toxicant was found to be correlated with the effectiveness and concentration of the spreading agent. The more effective spreading agents and the higher concentrations resulted in greater insecticidal efficiency of the solution. The penetration of aqueous solutions under the body of the California red scale may be demonstrated with the aid of a water-soluble dye.

A list is given of 22 references to the literature.

Arsenical and lead residues on cabbages, W. Cottier and P. J. Clark (*New Zeal. Jour. Sci. and Technol., 21 (1939), No. 1A, pp. 14A–23A*).—In experimental work reported it was found that, if the hearts only are used for human consumption, cabbages may be sprayed with lead and calcium arsenates at the rate of 2 lb. per 100 gal. of water up to six times at intervals of approximately 1 to 2 weeks until a date 3 weeks from harvesting without the residue figure being above that likely to injure health. If all the foliage of the plant be used without the removal of the loose outside leaves, even where an interval of 6 weeks is left between the last spraying and harvesting and with only three applications the residues may be above a reasonable level, and where an interval of less than 6 weeks is allowed the residues will probably be excessive. If dusts of lead or calcium arsenate (1 part arsenate to 5 parts hydrated lime by volume) are applied at 25 lb. per acre three or four times at intervals of 2 to 3 weeks with a period of approximately 6 weeks between the last treatment and harvesting, there are not likely to be dangerous residues if hearts only are used. With whole cabbages the residues may be excessive. Cauliflower plants sprayed with arsenicals in the late summer or autumn are unlikely to contain excessive residues when harvested in the following spring.

Seek new non-residue sprays, L. B. Norton (*Farm Res. [New York State Sta.], 6 (1940), No. 1, p. 15*).—Reference is made to work under way aimed at elimination of poisonous residues which may result from the application of insecticide sprays for the protection of fruits. Promising results have been obtained, especially in the tests of nicotine compounds.

Rotenone series compounds: A study of toxicity to the housefly of optically active and inactive compounds of the rotenone series, W. N. Sullivan, L. D. Goodhue, and H. L. Haller. (U. S. D. A.). (*Soap, 15 (1939), No. 7, pp. 107, 109, 111, 113, figs. 2*).—In the work reported "rotenone, *l*-dihydrorotenone,

l-β-dihydrorotenone, *l*-dihydrodeguelin, *l*-deguelin concentrate, racemic deguelin, and racemic dihydrodeguelin have been tested against the housefly (*Musca domestica* L.). In acetone solution the two optically inactive (racemic) compounds are much less toxic than are the optically active ones, but when tested in highly refined kerosene containing cyclohexanone the toxicity of the racemic compounds is approximately the same or only slightly less than the optically active compounds. A concentrate containing more than 80 percent of *l*-deguelin has been prepared."

A list is given of 18 references to the literature cited.

Tree injection and insect attack, R. C. Fisher (*Empire Forestry Jour.* [*London*], *18* (*1939*), *No. 1, pp. 125–128*).

A preliminary study of the anthelmintic activity in vitro of fresh pineapple juice, C. F. Asenjo. (Univ. Wis.). (*Jour. Amer. Pharm. Assoc., 29* (*1940*), *No. 1, pp. 8–10, fig. 1*).—Following a brief review of the literature, presented with a list of 22 references, experiments are reported which have shown fresh pineapple juice to digest parasites in vitro. "The time required for visible signs of digestion to take place is from 3 to 4 hr. Digestion takes place on the live parasite. The juice maintains its digestive activity on *Ascaris* at a concentration of 15 percent. A temperature of 65° C. or above inactivates the enzyme present in the juice. Juice from Cuban, Puerto Rican, and Mexican pineapples exhibits the same digestive activity on parasites in vitro. Canned juice has no digestive activity on parasites."

[**Protection of alfalfa seed crop against plant bugs**] (*U. S. Dept. Agr., Bur. Plant Indus. Rpt., 1939, pp. 13, 14*).—Reference is made to work conducted in cooperation with the Bureau of Entomology and Plant Quarantine and the Utah Experiment Station in the search for a means of protecting alfalfa against attacks of a plant bug (*Lygus* sp.) that is a major factor in the reduction of alfalfa seed yields in the intermountain region.

Fruit pests and their control, P. O. Ritcher, W. D. Valleau, and W. W. Magill (*Kentucky Sta. Bul. 393* (*1939*), *pp. 119–179, figs. 20*).—A practical account of fruit pests and their control, intended for use by the fruit grower.

Insect enemies of cacao in Bahia [trans. title], G. Bondar (*Inst. Cacau, Bahia, Bol. Téc. 5* (*1939*), *Sér. Pragas e Molestias, pp.* [*5*]+*112,* [*pls. 50*]).—The more important insects attacking cacao in the State of Bahia, Brazil, are considered by orders and families. A list is given of the literature consulted.

[**Contributions on forest insects and their control in Quebec**], A. R. Gobeil (*Quebéc Min. Terres et Forêts Buls. 1* (*1937*), *pp. 7, fig. 1; 2* (*1938*), *pp. 21, pl. 1; 3* (*1939*), *pp. 48, pl. 1, figs. 6*).—These contributions consist of (1) Notes on *Phyllotoma nemorata* Fallen, which leaf-mining sawfly is a source of injury to the white or gray and paper birches (*Betula populifolia* and *B. papyrifera*) and has been very abundant on birches of the park reserve, County of Kamouraska, (2) Injuries Caused by Insects to Forests of the Gaspé Peninsula, and (3) Forest Insects of Quebec in 1938.

Interesting household pest control problems, P. N. Annand. (U. S. D. A.). (*Pests, 7* (*1939*), *No. 12, pp. 6, 7*).

[**Insect transmission of plant disease**] (*Phytopathology, 30* (*1940*), *No. 1, pp. 2, 3, 7, 8, 15, 16*).—Abstracts are given of contributions on Mechanical Transmission of Aster-Yellows Virus to Leaf Hoppers [*Macrosteles divisus*], by L. M. Black (pp. 2, 3); The Dissemination of Yellow Dwarf of Potatoes and Its Leaf Hopper Vector *Aceratagallia sanguinolenta*, by E. D. Hansing and V. L. Frampton (p. 7); A Fungous Parasite [*Beauveria* sp.] of the Pine Bark Beetle [Southern Pine Beetle], by J. G. Harrar and J. G. Martland (p. 8); Fungi Associated With *Scolytus multistriatus* in Regions Where *Ceratostomella ulmi* Has Not Been Found, by J. G. Leach (p. 15); and Dissemination of the New York Aster

Yellows Virus and Its Leaf-Hopper Vector *Macrosteles divisus* in Endive Beds, by M. B. Linn (p. 16).

Air transport, insects, and disease, F. G. Sarel Whitfield (*Bul. Ent. Res., 30 (1939), No. 3, pp. 365-442, pl. 1, figs. 2*).—Studies of the carriage of insects by aircraft, commenced in July 1935, are reported at length, the details being given in 13 tables. The introduction of a malarial vector from one faunal region to another and the effects thereof are discussed. The literature of the epidemiology of yellow fever, particularly the work done on the insect vectors and the susceptible animals, is reviewed, and the implications thereof in connection with air transport are considered. The air communications of the world are shown as a map. Maps of Africa and South America showing the air routes and yellow fever areas are presented. The control of airports and aerodromes is discussed, in connection with which the literature on the flight range of insects, the dissemination of insects by wind, and insects and the upper air is reviewed. A comparison is made between the insects collected from the terrestrial zone of the atmosphere and those from the upper air. The work done upon insects found in aircraft is reviewed, and the results are incorporated together with those from Khartoum in a "world list" table. The work done in Khartoum is described, and this, together with other workers' results, is analyzed. A comparison is made between insects found in the terrestrial zone, the upper air or "plankton zone," and those found in aircraft. The medical, veterinary, and agricultural aspect of insects found in aircraft is discussed. The control of insects in aircraft is considered, and suggestions are made for future research.

A classified bibliography of 11 pages is included.

Termite damage: Preventives and remedies, W. J. Baerg (*Arkansas Sta. Bul. 385 (1940), pp. 27, figs. 11*).—A practical summary of information on termites, their biology, economic importance, preventives, and control.

Some observations on commercial termite control operations, N. Turner (*Pests, 8 (1940), No. 1, pp. 10, 11*).

An expedition to Arabia for locust investigations, M. Hussein (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 225 (1939), pp. [3]+22, pls. 10*).

The lily thrips, S. F. Bailey. (Univ. Calif.). (*Calif. Dept. Agr. Bul., 28 (1939), No. 7-9, pp. 479-483, fig. 1*).—An account of the lily thrips *Liothrips vaneeckei* Pr., which was found well established on bulbs of *Lilium pardalinum* at Berkeley in September 1938, is presented with a list of 26 references to the literature. It has not as yet become necessary in California to practice any control measures.

Populations of Thrips tabaci, with special reference to virus transmission, W. Carter. (Hawaii. Pineapple Prod. Expt. Sta.). (*Jour. Anim. Ecol., 8 (1939), No. 2, pp. 261-276, pl. 1, figs. 4*).—The details of studies conducted in which the populations of the onion thrips on *Emilia sonchifolia* DC were recorded from four locations and data on wind dispersal of thrips species in pineapple were recorded from one location on the Island of Oahu, Territory of Hawaii, are presented in 11 tables and several graphs. "Population densities varied widely between locations, but seasonal trends were the same at all four points with populations decidedly lower in the winter months. The percentage of disease in *Emilia* followed closely the percentage of plants that were thrips infested, indicating that once a colony of *T. tabaci* is established on *Emilia* there is little movement therefrom. Diseased *Emilia* plants maintain higher populations of *T. tabaci* on the average than do healthy *Emilia*. Wind trap data indicate that *T. tabaci* is not a migratory species. Most of the species caught attained their greatest incidence and numbers during the fall and winter months. Incidence of yellow spot disease in pineapple is not correlated with *T. tabaci* populations on *Emilia* in nearby areas. This is ac-

ounted for on the grounds that *Emilia* is a favored host from which dispersal does not normally occur. Cultivation of host plant areas and drought are two possible dispersal factors."

A new species of Dieuches Dohrn (Hem.: Lygaeidae) injurious to strawberries in Tasmania, J. W. Evans (*Bul. Ent. Res., 30 (1939), No. 3, pp. 305, 306, fig. 1*).—Under the name *D. raphaeli*, a lygaeid bug well known for a long time as a pest of strawberries in Tasmania is described as new. The bugs feed on ripe and ripening fruit and cause distortion and discoloration of the berries as well as imparting a disagreeable taint.

Observations on cotton stainers (Dysdercus) in the West Indies, F. A. Squire (*Bul. Ent. Res., 30 (1939), No. 3, pp. 289–292, figs. 3*).—Observations of cotton stainers made in the eastern group of the West Indies, or Lesser Antilles, extending from Trinidad to the Virgin Islands, are noted.

Two new aphids appear on wheat, M. A. Palmer (*Colo. Farm Bul. [Colorado Sta.], 2 (1940), No. 1, p. 2*).—Mention is made of two kinds of aphids that heavily infested the wheatfields in northeastern Colorado, southern Nebraska, and adjacent parts of Kansas in the fall and winter of 1938. Neither form seems to have been previously recorded on wheat in this country. One appears to be *Rhopalosiphum splendens* (Theob.), first described from wheat in Egypt in 1915 and later reported on wheat and grasses in Morocco.

Five Mucrotrichaphis aphids, G. F. Knowlton and M. W. Allen. (Utah Expt. Sta.). (*Ohio Jour. Sci., 40 (1940), No. 1, pp. 31–35, figs. 25*).—The genus *Mucrotrichaphis* is erected, and four of the five species considered are described as new under the names *M. albicornus*, *M. toti*, *M. zerohypsi*, and *M. flavila*.

Aphid vectors of the virus of woodiness or bullet disease in passion fruit (Passiflora edulis Sims), R. J. and N. S. Noble (*Roy. Soc. N. S. Wales, Jour. and Proc., 72 (1939), pp. 293–317, pls. 2, fig. 1*).—The authors have found in investigations, particularly during the past 3 yr., that passion vines are not subject, as a rule, to serious infestation by insects. "Occasional infestations by species of jassids, thrips, and aphids were recorded. The aphids *Myzus persicae* and *Macrosiphum solanifolii* were recorded from time to time. The latter, however, appeared to occur even less frequently than the former. It was demonstrated that two species of dark aphids characterized in this paper as *Aphis* sp. A and *Aphis* sp. B, *M. persicae*, and *M. solanifolii* were capable of transmitting the virus of woodiness disease to passion plants. The disease developed as a rule in from 6 to 11 days after infective aphids had fed on healthy plants under the conditions of the experiments. In a limited series of tests it was demonstrated, in the case of *Aphis* sp. B. and *M. persicae*, that one aphid could obtain the virus by feeding for 24 hr. or less on a diseased passion plant and could transmit the disease after feeding on a healthy passion plant for 24 hr. or less. Tests failed to demonstrate that insects other than aphids were capable of functioning as vectors of the woodiness virus."

Work on insecticides against the cabbage white butterfly Pieris rapae L., W. Cottier (*New Zeal. Jour. Sci. and Technol., 21 (1939), No. 1A, pp. 23A–45A*).—Report is made of experiments conducted with lead arsenate, calcium arsenate, barium silicofluoride, derris, pyrethrum, and nicotine sprays and dusts, atomized kerosene extracts of pyrethrum, summer oil sprays with and without derris, common salt sprays, and decoctions of boiled lettuce leaves. Excellent results were secured with derris dusts stated to contain 0.75 percent rotenone and with derris sprays, although certain of these latter deteriorated in killing power on storage. A pyrethrum spray and atomized kerosene extracts of pyrethrum gave good to very good results, while lead and calcium arsenate sprays at 2-lb. per 100 gal. of water gave excellent results. Certain lead and calcium

arsenate dusts gave a reasonably good control; all the other materials gave inferior to very poor results.

The heat production and oxygen consumption of pupae of Galleria mellonella at different constant temperatures, J. Bell (*Physiol. Zool., 13 (1940), No. 1, pp. 73–81, fig. 1*).—In the work reported measurements of the heat production and of the oxygen consumption were made at 25°, 35°, and 40° C. on individual wax moth pupae throughout development. The measured rates of heat production were corrected for the heat used in the evaporation of water from the animals. "In making this correction the following observations have been made: (1) An increase in temperature from 25° to 35° does not appreciably change the average percentage of weight lost in the pupae, but an increase from 35° to 40° results in a considerably greater loss in both sexes. (2) The change in weight due to respiration is an actual gain, and the rates of such gains at the three temperatures under investigation have been calculated. (3) The rates of loss of water from the pupae are not greatly altered by an increase in temperature from 25° to 35°, but an increase from 35° to 40° results in a much greater loss of water. An increase in temperature from 25° to 35° results in an acceleration of the metabolic processes at all stages of development, but this effect is greatest during the latter part of the period. An increase in temperature from 35° to 40° does not appreciably alter the rate of metabolism during the early part of metamorphosis, but during the latter part of the period the rate is greatly increased. The average total amount of heat produced by the animals at 35° is approximately the same as that produced by animals at 25°. The same was found to be true in the case of the oxygen consumption. In animals kept at 40°, however, there is a much greater average total heat production and oxygen consumption than at either of the other two temperatures. The calorific quotients for various stages of development have been obtained. The average calorific quotients for the pupal period vary from 3.13 to 3.69."

The raspberry-bud moth Carposina adreptella Walk., F. J. Jeffreys (*New Zeal. Jour. Sci. and Technol., 21 (1939), No. 2A, pp. 114A–125A, figs. 11*).—The morphology, life history and habits, seasonal history, economic importance, parasites, and control measures for *C. adreptella* in New Zealand, where in the Nelson District considerable damage was done to raspberry canes during the season of 1936–37, are considered.

The fall armyworm: An unwelcome invader from the South, L. A. Carruth (*Farm Res. [New York State Sta.], 6 (1940), No. 1, pp. 7, 11, figs. 3*).—Reference is made to the importance of the fall armyworm, which with a few exceptions successfully survives the winter only in the southern portions of Florida and Texas and regions farther south and, commencing in the spring, migrates farther northward with each succeeding generation until it reaches New York State in mid-August. Though reported to be a promising means of control in Virginia, the application of lead arsenate to the corn foliage as a spray in eastern New York has resulted in some foliage burning, and the stalks have been rendered unfit for feeding purposes.

Investigations on the cotton bollworm (Heliothis armigera Hubn. (obsoleta Fabr.)).—I, The annual march of bollworm incidence and related factors, F. S. Parsons (*Bul. Ent. Res., 30 (1939), No. 3, pp. 321–338, pl. 1, figs. 5*).—Report is made of methods employed in the study of the bollworm, character of the seasons and food-plant situations in eastern Transvaal, Swaziland, and Natal, bollworm incidence, and moth flights and the origin of moths.

Contribution to the physical ecology of Tortrix postvittana Walk. (Lep.), L. J. Dumbleton (*Bul. Ent. Res., 30 (1939), No. 3, pp. 309–319, figs. 2*).—Studies of the velocity of development of *T. postvittana* in relation to temperature,

larval instars, and factors in larval mortality, the details of which are given in tables, are reported.

Proceedings and papers of the tenth annual conference of Mosquito Abatement Officials in California, edited by H. F. Gray and R. B. Van Etten (*Calif. Mosquito Abatement Off., Ann. Conf., Proc. and Papers, 10 (1939), pp. [2]+73*).—A mimeographed report of the proceedings of the conference held at Berkeley, Calif., December 11, 1939.

The hessian fly in Indiana, C. M. Packard and W. B. Cartwright. (Coop. U. S. D. A.). (*Indiana Sta. Bul. 440 (1939), pp. 15, figs. 5*).—Experimental data secured from field tests in Indiana, the details of which are given in tables, have shown early seeded wheat to be most heavily infested by the hessian fly, and that wheat seeded on or soon after the safe dates produces better yields in years of severe infestation. Since the hessian fly can build up from low to extremely high and injurious populations within a single year, as is shown by the data presented, the general adherence to the safe seeding dates every year is essential if losses due to this pest are to be prevented.

Lochetic luminous dipterous larvae, B. B. Fulton (*Jour. Elisha Mitchell Sci. Soc., 55 (1939), No. 2, pp. 289–293, pl. 1*).

Screwworms infest beaver in Texas, A. H. Cook (*Jour. Mammal., 21 (1940), No. 1, p. 93*).—Report is made of the finding of the larvae of the screwworm in 3 of 40 beaver (*Castor canadensis texensis*) that were trapped during the summer of 1939 in Kimble County, Tex.

Corrections and additions to the Clemson list of Scarabaeidae and other records from South Carolina (Coleoptera: Scarabaeidae), O. L. Cartwright. (S. C. Expt. Sta.). (*Ent. News, 50 (1939), No. 10, pp. 284–286*).—Since the publication (E. S. R., 72, p. 665) of a list of Scarabaeidae collected at Clemson, S. C., 16 additional species have been taken in the same small area, bringing the total to 163 species and representing 51 genera of the family.

White grubs and pasture deterioration on the Atherton Tableland, D. O. Atherton (*Queensland Agr. Jour., 52 (1939), No. 5, pp. 484–522, figs. 5*).—Pasture management, lucerne, and fodder crops are considered in this discussion of the control of the scarabaeid beetle *Lepidiota caudata* Blkb.

The biology of Lema sexpunctata Oliv., G. Green. (Univ. Ark.). (*Jour. Kans. Ent. Soc., 12 (1939), No. 4, pp. 128–132, figs. 2*).—Studies of the biology of *L. sexpunctata*, a leaf beetle in the subfamily Criocerinae, which feeds on the dayflower (*Commelina communis*) in both the larval and adult stages, are reported, the details being given in tables.

The grape bud beetle Glyptoscelis squamulata Crotch, W. Ebeling. (Calif. Citrus Expt. Sta.). (*Calif. Dept. Agr. Bul., 28 (1939), No. 7–9, pp. 459–465, figs. 3*).—*G. squamulata*, which spread from its native host, became a source of injury to the grape in Las Vegas Valley, Nev., in 1922, in Coachella Valley, Calif., in 1923, and in Kings River bottoms near Sanger, Calif., in 1936. It has also been reported as attacking the tender leaves and terminal buds of peaches in the Sacramento Valley in areas near brushlands.

Blister beetles and ladybird beetles taken at a Nebraska light trap, D. B. Whelan. (Nebr. Expt. Sta.). (*Jour. Kans. Ent. Soc., 12 (1939), No. 4, pp. 118–120*).—Notes are presented on four species of blister beetles and nine of ladybird beetles taken in a light trap at Lincoln during the 6 yr. 1933–38.

Investigations on wireworms and their control, H. W. Miles and M. Cohen (*Univ. Manchester, Ent. Field Sta., Warburton, Cheshire, Rpt., 1938, pp. 6, 8–35, figs. 6*).—Report is made on the continuation of the work with wireworms (E. S. R., 81, p. 685).

Destruction of alfalfa weevil (Hypera variabilis) by fumigation and other means, D. B. Mackie and W. B. Carter (*Calif. Dept. Agr. Bul., 28 (1939), No. 7–9, pp. 466–470*).—A preliminary report is made of the efficiency of methyl bromide for the fumigation of alfalfa and other baled hay for the destruction of the alfalfa weevil.

A method of queen-rearing for the commercial beekeeper, G. P. Beyleveld (*Union So. Africa Dept. Agr. and Forestry Bul. 193 (1939), pp. 15, figs. 6*).

[Honeybees and honey plants] (*Amer. Bee Jour., 79 (1939), No. 12, pp. 568–570, figs. 5*).—A brief review is given of the work and publications of John H. Lovell relating particularly to the life habits of bees and to nectar and pollen-producing plants of value to apiculture, extending over a period of some 40 yr. up to the time of his death in 1939.

Deluge peach orchards with parasites for fruit moth control, D. M. Daniel (*Farm Res.* [*New York State Sta.*], *6 (1940), No. 1, pp. 5, 11, figs. 3*).—A brief report is made of the results of the first year's work which indicate that substantial reductions in fruit infestations by the oriental fruit moth may be immediately accomplished through mass liberation of the *Macrocentrus* parasite (*M. ancylivorus*). This results from its attack upon the twig-infesting larvae in peach orchards.

The Ephialtes (Hym.: Ichn.) parasitising the codling moth, J. F. Perkins (*Bul. Ent. Res., 30 (1939), No. 3, pp. 307, 308, figs. 4*).—The author finds that two species of parasites of the codling moth have been confused under the name *E.* (*Calliephialtes*) *extensor* Tasch. 1868. Neither of these is *E. extensor*, which is a synonym of *E. punctulata* Ratz. They are *E. caudata* Ratz. 1848 and *E. crassiseta* Thoms. 1877.

The North American species of the genus Laelius Ashmead (Hymenoptera: Bethylidae), C. F. W. Muesebeck. (U. S. D. A.). (*Biol. Soc. Wash. Proc., 52 (1939), pp. 171–175*).—The bethylid parasite *L. voracis*, reared from the furniture carpet beetle *Anthrenus vorax* Waterh., at Washington, D. C., is described as new. Notes are given on four additional species of this genus.

A new pest of raspberry in New Zealand (Priophorus tener Zaddach), F. J. Jeffreys (*New Zeal. Jour. Sci. and Technol., 21 (1939), No. 2A, pp. 107A–113A, figs. 8*).—The European sawfly *P. tener* is recorded for the first time as a pest of raspberry in south Canterbury, and notes are given on its life history and bionomics.

The male, nymph, and larva of Ixodes dentatus Marx (Acarina: Ixodidae), C. N. Smith. (U. S. D. A.). (*Ent. Soc. Wash. Proc., 42 (1940), No. 1, pp. 16–20, figs. 9*).—Descriptions of the several stages of *I. dentatus*, which commonly infests cottontail rabbits on the island of Martha's Vineyard, Mass., are presented.

The ticks of East Africa, E. A. Lewis (*Empire Jour. Expt. Agr., 7 (1939), Nos. 27, pp. 261–270; 28, pp. 299–304*).—Part 1 of this contribution relates to species, distribution, influence of climate, habits, and life histories, and part 2 to tick-borne diseases and their control.

The blue oat or pea mite Penthaleus major (Duges) in California, E. O. Essig. (Univ. Calif.). (*Calif. Dept. Agr. Bul., 28 (1939), No. 7–9, pp. 507, 508, fig. 1*).—*P. major*, which has for a number of years been a pest of some importance in Australia and South Africa and has been known in Europe since its description in 1834, is found to be the form that attacks the springtail *Achorutes armatus* Nicolet and causes injury to peas growing along the foothills near Warmsprings, Calif.

Citrus red mite on ornamental plants, R. H. Smith. (Univ. Calif.). (*Calif. Dept. Agr. Bul., 28 (1939), No. 7–9, p. 506*).—Notes are given on a number of

hrubs and trees which have not heretofore been recorded as hosts of the citrus ed mite.

Tetranychidae of Connecticut, P. GARMAN (*Connecticut [New Haven] Sta. Bul. 431 (1940), pp. 63–88, figs. 23*).—An account is given of 16 species of red spiders, representing 7 genera, which are commonly encountered and the source of damage to agricultural crops, including descriptions of and generic and specific keys for their identification. Of these *Schizotetranychus spireafolia*, found abundantly on *Spiraea latifolia* at New Haven, Hamden, and Bethlehem; *Tetranychus ellipticus*, found on honey locust at New Haven and Glastonbury; and *T. pallidus*, found abundantly on the leaves of the beech at New Haven and also at Hamden and Southington, are described as new to science. A partial host index of species found in Connecticut is included.

Eriophyid studies, VII, H. H. KEIFER (*Calif. Dept. Agr. Bul., 28 (1939), No. 7–9, pp. 484–505, figs. 22*).—This further report of the eriophyid studies (E. S. R., 82, p. 354) contains descriptions of 22 species, of which 21 are described as new to science.

Centipedes and millipedes in the house, E. A. BACK (*U. S. Dept. Agr. Leaflet 192 [1939], pp. 6, figs. 6*).—A practical account dealing particularly with five species of centipedes (*Scolopendra obscura* Newp., *S. heros* Girard, *S. morsitans* L., *Lithobius forficatus* L., and the house centipede) and three species of millipedes (*Parajulus venustus* Wood and *P. impressus* Say, which are frequently annoying to householders, and *Spirobolus marginatus* Say). They are normally outdoor creatures, centipedes feeding upon insects and other small animals and not injuring plants or house furnishings. Millipedes are not carnivorous; they feed upon decaying vegetable matter in damp soil and on decaying wood and often eat the tender roots of plants and even green leaves that touch the ground.

Distribution of Fasciola hepatica Linn. and its potential vectors in Canada, H. J. GRIFFITHS (*Sci. Agr., 20 (1939), No. 3, pp. 166–169*).

ANIMAL PRODUCTION

[Animal husbandry investigations by the Bureau of Animal Industry] (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt., 1939, pp. 8–14, 16–20, 25, 26, 27, 29–31, 33–35, 37–39*).—Results are briefly reported for the following lines of investigation: Mineral deficiencies in cattle; the vitamin A requirements of cattle; the utilization of sorghum grains in cattle rations; the effect of grade of steers on the efficiency of feed utilization; molasses as a substitute for corn; the use of grass and legume hay as sole rations for beef cattle; the utilization of pastures and ranges in beef production; the use of soybeans in lamb-fattening rations; the value of sugar beet byproducts for fattening lambs; rates of stocking sheep on range; the utilization of temporary pasture crops for sheep; malnutrition of milking goats; structural characteristics in animal fibers; methods of sampling fleeces for predicting clean wool yields; the physiology of blood formation in swine; the effect of supplementary feeding of protein-rich feed to pigs on subsequent gains; the value of ground lespedeza hay in pig rations; the vitamin B_1 requirements of pigs; lameness in pigs due to dietary deficiency; methods for measuring capabilities of horses and mules; substitutes for mare's milk in the nutrition of young foals; factors affecting the levels of calcium, magnesium, phosphatase, and phosphorus in the blood of horses; factors influencing the quality and palatability of beef, lamb, pork, and turkeys; methods for the determination of lignin in feeds; the influence of vitamin E deficiency in rats; the optimum level of minerals in rat nutrition; the use of rats for predicting the feeding value of grasses; optimum levels of protein feeding for young chickens and turkeys; the efficacy of alfalfa leaf meal as a source of

vitamin A for poultry; the effect of varying planes of nutrition on the egg-laying cycle in hens; and the extent and nature of participation in the National Poultry Improvement Plan. Much of the work recorded was in cooperation with other bureaus and the State experiment stations.

[**Livestock investigations in Colorado**] (*Colorado Sta. Rpt. 1939, pp. 14, 15, 20, 21, 47–50*).—Results are briefly noted on the wintering of beef heifers, wintering ewes, the use of milo or barley as partial substitutes for corn in lamb feeding, the value of beet byproducts for lamb feeding, the relation of type of ration to formation of urinary calculi in lambs, the vitamin G requirements of turkey breeders, sources of green feed for poultry, trace elements in poultry nutrition, and the iodine requirements of poultry.

[**Livestock investigations in Georgia**] (*Georgia Sta. Rpt. 1939, pp. 46–49, 49–52, 53–56, 57–59, 60, figs. 4*).—Results are briefly reported for the following lines of investigation: The returns secured from improved and unimproved pastures when grazed with beef cows and calves or with steers, the effect of stage of growth and of nitrogen fertilizer on the composition of Bermuda grass, a comparison of silage v. peanut hay and of peanut meal v. cottonseed meal for fattening cattle, the value of supplementary concentrates for young beef cattle on pasture, the winter feed requirements of the beef cattle breeding herd, the effect of length of day on the breeding season of sheep, the use of Hampshire and Southdown rams for improving the lamb- and wool-producing quality of native sheep, and the maximum use of peanut meal in swine feeding.

[**Livestock investigations in Iowa**] (*Iowa Sta. Rpt. 1939, pt. 1, pp. 83–89, 91–94, 96–98*).—Brief progress reports (E. S. R., 81, p. 84) are presented for the following studies, by C. C. Culbertson, J. L. Lush, M. D. Helser, F. J. Beard, B. H. Thomas, J. A. Schulz, P. S. Shearer, S. H. McNutt, P. M. Nelson, and L. Yoder, evaluation of swine breeding stock by determining the growth, gains, ability to utilize feed, and carcass quality of the offspring; determination of the factor present in linseed-oil meal or linseed oil which is responsible for finish on fattening yearling steers; the relation of vitamin E to the reproduction of swine and sheep; the adaptability of the rat for studying the chemical relationships between food ingested and the softness of body fat; the influence of different amounts of soybeans and their products upon the quality of pork and the character and keeping qualities of lard; the influence of low temperatures upon beef and pork held in storage for different intervals; and the production of derivatives of sterols and their role in nutrition.

From poultry investigations, by E. W. Henderson, H. L. Wilcke, C. D. Lee. Thomas, N. F. Waters, R. F. Phillips, and B. Lowe, results are briefly reported on the biological value of different levels of meat scraps and milk combinations for egg production; the influence of rations and management on egg quality and egg size; the effects of levels and sources of protein and inorganic elements in the ration upon slipped tendons in chicks and poults; the relationship between viscosity index of eggs, as measured with a torsion pendulum, and hatchability; factors in oats which affect growth and feathering in domestic poultry; and the effect of the ration and the fattening period upon gains and quality of market poultry.

[**Experiments with livestock and poultry in Maryland**]. (Partly coop. U. S. D. A.). (*Maryland Sta. Rpt. 1939, pp. 30, 31, 34, 35, 40–42, 70, 71, 72, figs. 2*).—Brief progress results are reported on the energy value of distillers' byproducts in the ration of beef steers, factors affecting moisture losses and salt penetration in hams, the efficiency of feed utilization by various purebred strains and crossbred lines of chickens, the nutritive requirements of poultry with special reference to vitamin A and riboflavin, inheritance of inherent vigor, the effect of certain hormones on the rate of sexual maturity in young cockerels and on the

breeding efficiency of old cocks, factors affecting the quality of eggs, the influence of different micro-organisms upon the quality of frozen egg products, and the influence of "fattening" diets on the intestinal flora of chickens.

[Experiments with livestock by the Cornell Station] (*[New York] Cornell Sta. Rpt. 1939, pp. 109, 110, 111, 112, 113, 115, 117–120, 164–167, 171*).—Progress reports (E. S. R., 81, p. 85) of animal investigations, by R. B. Hinman, J. I. Miller, F. B. Morrison, J. P. Willman, S. A. Asdell, E. L. Worthen, R. W. Pease, N. F. Smith, L. A. Maynard, P. Olafson, J. K. Loosli, L. M. Massey, B. L. Richards, Jr., C. M. McCay, G. H. Ellis, L. L. Barnes, G. Sperling, G. Kimball, M. J. Babcock, R. Bernard, E. Ackerman, and R. E. Bowers, include those on gains of beef steers on improved pasture; the nutritive value of the proteins in common protein-rich supplements and in typical legume and nonlegume rations; a comparison of various protein supplements, supplemental mixtures, and vitamin supplements for growing and fattening pigs; rations and methods of feeding lactating sows and their pigs; the causes and prevention of birth mortality in pigs; large-scale sheep and wool production studies; the value of various forage crops as temporary pastures for lambs; the relation of feeding and management to the cause of the stiff-lamb disease; the effect of sulfur dioxide and other forms of sulfur on the nutritive value of vegetation; the prolongation of the productive life of animals; insects as test animals for vitamin assays; and the nutrition of foxes and minks.

Reports of poultry investigations, by L. C. Norris, G. F. Heuser, and A. L. Romanoff, include the requirements of poultry for the components of the vitamin G complex, the role of manganese in poultry nutrition, the protein requirements of laying hens, methods for the quantitative determination of riboflavin in materials of probable nutritive value, the value of charcoal in poultry feeding, the evaluation of the hatchability of eggs prior to incubation, and the artificial incubation of duck eggs.

Hay quality: Relation to production and feed value, E. O. Pollock and W. H. Hosterman (*U. S. Dept. Agr., Misc. Pub. 363 (1939), pp. 34, figs. 24*).—Based on a compilation of experimental data, quality in hay is discussed with reference to stage of maturity, value of leaves in hay, green color, foreign material, vitamins, condition, size and pliability of stems, and aroma. Other items discussed include cuttings per year, curing and storing methods, the chopping of hay, and the relationship between grade and price of alfalfa.

Commercial feeding stuffs, L. S. Walker, E. F. Boyce, and L. E. Davis (*Vermont Sta. Bul. 455 (1939), pp. 47*).—The usual report of the analyses for protein, fat, and fiber of 1,937 samples of feeding stuffs collected for official inspection during April 1939 (E. S. R., 81, p. 691).

Rice straw and molasses as supplements to pasture feeds for range cattle, R. G. Macahilig (*Philippine Agr., 28 (1939), No. 7, pp. 561–575*).—In the described experiment, two groups of six cows each were allowed to graze together on a pasture of approximately 20 acres. One group received in addition to the pasture a daily supplement of rice straw and cane molasses. During the dry season of March to June (112 days) the supplemented group consumed an average of 0.683 kg. of straw and 1.52 kg. of molasses per head daily, while during the wet season of June to January (196 days) they consumed 1.23 kg. of straw and 1.21 kg. of molasses daily. The average total gains during the dry season were 29.4 and 1.4 kg. and during the wet season 19.9 and 16.5 kg. for the supplemented and unsupplemented groups, respectively. Thus it is evident that supplementary feeding had a much more favorable effect during the dry season than during the wet season. In the latter case the increased rate of gain was insufficient to justify the cost of the supplement.

A comparative study of the amount of soilage and silage consumed by Philippine and Nellore cattle, V. VILLEGAS and A. C. ELEFAÑO (*Philippine Agr., 28 (1939), No. 7, pp. 543–552*).—In the trials reported Napier grass was fed as a soiling crop and the silage was made from yellow flint corn. These materials constituted the sole ration during the experimental periods. The average daily consumption of soiling crops and silage, respectively, per 100 kg. of live weight was for Philippine cows 11.7 and 7.9, Philippine bulls or steers 9.5 and 5, Nellore cows 8.5 and 7.9, and Nellore bulls 7.1 and 6 kg.

The composition and digestibility, when fed to pigs and sheep, of potato cossettes and potato meal, H. E. WOODMAN and R. E. EVANS (*Jour. Agr. Sci. [England], 29 (1939), No. 3, pp. 347–363*).—Potato cossettes are described as artificially dried fingerlike pieces of pulped potato. The meal was prepared by grinding the cossettes. The meal and cossettes contained, respectively, dry matter 89.8 and 90.2 percent, protein 9.76 and 10.54, and nitrogen-free extract 83.38 and 82.39 percent. Digestion trials with pigs indicated as coefficients of digestibility for potato meal, dry matter 89.4, organic matter 89.2, crude protein 39.9, and nitrogen-free extract 96.4 percent. Digestion trials with sheep indicated the following coefficients of digestibility for the meal and cossettes, respectively: Dry matter 80.4 and 80.9, organic matter 81 and 81.4, crude protein 51 and 45.4, and nitrogen-free extract 87.4 and 88. The apparent low digestibility of potato protein was shown not to be due to an inherent lack of digestibility in the potato protein, but rather to a depression of the digestibility of the protein in the ration as a whole occasioned by the presence of potato meal.

Investigations on chilled beef.—II, Cooling and storage in the meatworks, W. J. SCOTT and J. R. VICKERY (*Austral. Council Sci. and Indus. Res. Bul. 129 (1939), pp. 68, figs. 23*).—Continuing this series of investigations (E. S. R., 82, p. 522), the results of extensive studies on the nature and extent of changes in the acquired microbial population during the cooling and storing of beef are recorded. Of the microflora acquired by beef during dressing, only the bacteria were found to undergo any appreciable change during cooling. Controlled experiments in which exposed muscle surfaces of the aitch and neck areas were inoculated with cultures of a standard organism indicated that the extent of change in bacterial population depended mainly on the rate of cooling of surface tissue and the rate and extent of surface desiccation. At a fixed rate of cooling, increased air speed increased the rate of water removal and resulted in decreased bacterial population after 24 hours' chilling. Also the higher the rate of cooling, the better was the control of bacterial growth. Increase of bacteria in the neck muscles representative of the thin, moist areas was more difficult to control than on the aitch muscle. Following the initial chilling the extent of changes in bacterial population depended mainly on the drying power of the air. The high rate of water removal necessary to control bacteria also favored a reduction in the rate of loss of bloom of the beef during cold storage.

Freezing temperature as related to drip of frozen-defrosted beef, J. M. RAMSBOTTOM and C. H. KOONZ (*Food Res., 4 (1939), No. 5, pp. 425–431, figs. 7*).—Experiments conducted in a commercial research laboratory gave evidence that irrespective of freezing temperature there was little drip in large rib cuts of beef where the area of cut surface was small in relation to the volume of meat. With small steaks the amount of drip was more dependent on freezing temperature. Steaks rapidly frozen with resulting intrafiber freezing showed a relatively small amount of drip on thawing, while those frozen slowly with resulting extrafiber freezing lost considerably more fluid when defrosted. Regardless of the temperature of freezing, however, the histological appearance of the defrosted muscle tissue was quite similar to that of unfrozen tissue.

A comparative study on the forage and water consumption of sheep and goats, P. P. Asuncion (*Philippine Agr., 28 (1939), No. 7, pp. 576–582*).—In a trial similar to that of Villegas and Elefaño noted on page 806, the average amount of soiling crops and silage, respectively, consumed daily per 100 kg. of live weight was for ewes 13.6 and 7.8, rams 11.1 and 6.8, does 9.9 and 6.3, and bucks 14.4 and 9 kg. All animals drank much less water when fed soiling crops than when fed silage.

Lambing and mating periods within the main sheep areas of Australia, E. F. Lawrence and L. C. Holmes (*Jour. Austral. Inst. Agr. Sci., 5 (1939), No. 4, pp. 200, 201, fig. 1*).—The lambing and mating periods within the main sheep-producing areas of Australia are discussed.

Karakul (fur-bearing) sheep and Persian lamb fur production, A. A. MacMillan (*Canada Dept. Agr. Pub. 654 (1939), pp. 9, figs. 5*).—Practical suggestions for the selection, breeding, and management of Karakul flocks and the production of Persian lamb fur are offered.

Production of hogs suitable for Wiltshire sides, R. E. Hutton and E. Z. Russell (Coop. Mont. Expt. Sta.). (*U. S. Dept. Agr. Cir. 532 (1939), pp. 35, figs. 8*).—Experiments were conducted at the Range Livestock Experiment Station at Miles City, Mont., over a period of 6 yr. to determine the most satisfactory procedure for the production of hogs suitable for conversion into Wiltshire bacon. Each trial included groups of purebred Yorkshire and Chester White pigs and groups representing reciprocal crosses of these breeds. Simple rations were fed throughout, consisting generally of alfalfa pasture, minerals, a small amount of tankage, and sufficient grain to maintain animals in the desired physical condition. The crossbred matings resulted in more weaned pigs per litter than purebred matings. The crossbred pigs made faster and more economical gains than the purebred pigs. The Yorkshire × Chester White cross gave the highest percentage of carcasses suitable for Wiltshire sides with 75.4 percent, followed by Chester White × Yorkshire crossbreds with 65.2, Yorkshires with 54, and Chester Whites with 51.4 percent. In comparison with the European Wiltshires the American sides were criticized for excessive saltiness, suggesting the need for improved curing methods in this country.

Colt production in Iowa, A. B. Caine (*Iowa Sta. Bul. P1, n. ser. (1939), pp. 30, figs. 4*).—Detailed records on colt production obtained from 300 representative farmers in the State are summarized. Eighty-nine percent of the farmers of this group preferred to raise colts rather than to buy them, and the general preference was for brood mares weighing from 1,500 to 1,600 lb. "Risk" and "bother" were offered as the principal objections to colt raising. The time lost from work by mares at foaling time averaged 13.25 days. The largest item of expense was for feed, most of which was home-grown, so that the actual cash expenditure for raising colts to working age averaged less than $30. On the average about 2.25 tons of grain and 2.5 tons of mixed hay, plus pasture and some cornstalks, were consumed by the colts to working age. Grain consumption could be materially reduced through more extensive use of pastures and roughages. The importance of using stallions of good type and conformation was generally recognized.

A study of the metabolism of fowls.—I, A calorimeter for the direct determination of the metabolism of fowls, T. Deighton (*Jour. Agr. Sci. [England], 29 (1939), No. 3, pp. 431–451, figs. 9*).—This contribution from the Institute of Animal Nutrition, Cambridge University, describes and illustrates in detail the apparatus and presents specific directions for its use.

Protein levels of rations for White Leghorn pullets, A. E. Tomhave (*Delaware Sta. Bul. 219 (1939), pp. [1]+57, figs. 8*).—The results of five separat growth experiments (from 0 to 20 weeks of age), involving in all 33 pens o

White Leghorn pullets, are summarized. Rations containing approximately 14, 16, 18, 20, and 22 percent protein, employed in various combinations, were compared in these trials. Among the several combinations of protein levels studied, the chicks receiving an 18 percent protein ration to 12 weeks of age and a 16 percent ration from 13 to 20 weeks excelled all other groups both in rate of gain and efficiency of feed utilization. Other groups ranking high in these respects were those receiving 18 percent protein throughout the growth period and those receiving 18 percent rations to 9, 10, or 11 weeks of age and a 16 percent ration thereafter. Lowering the protein ration below 18 percent prior to 8 weeks of age resulted in lower weight pullets at 20 weeks of age. Likewise reducing the protein content from 16 to 14 percent prior to 17 weeks of age resulted in lower weights at 20 weeks. Allowing pullets access to range from 8 to 20 weeks did not result in heavier birds at 20 weeks than similarly fed confined birds. The protein required to produce 1 lb. of gain was in direct proportion to the protein content of the ration. Bare breasts and feather eating were prevalent in the lower protein groups. The protein level during growth had little influence on the rate of egg production during the pullet laying year, but reducing the protein content below 18 percent prior to 8 weeks appeared to increase subsequent mortality during the laying year.

A comparative study of chicks raised indoors and outdoors, M. M. Ragat (*Philippine Agr., 28 (1939), No. 7, pp. 593–600*).—In three separate trials comparing the rate and efficiency of gain of similar groups of chicks brooded indoors and on range in portable brooders, each showed an advantage in favor of those raised outdoors. The average weights of the chicks at 12 weeks of age were 572.2 and 505.6 gm., the average feed consumption per chick was 2.27 and 2.42 kg., and the average mortality 22.02 and 36.12 percent for the chicks raised outdoors and indoors, respectively.

Anemia in chicks caused by a vitamin deficiency, A. G. Hogan and E. M. Parrott. (Mo. Expt. Sta.). (*Jour. Biol. Chem., 132 (1940), No. 2, pp. 507–517, figs. 2*).—When young chicks were fed a purified ration adequately supplied with the well-recognized vitamins and in addition a 95 percent alcohol extract of dried fresh pork liver, those which survived for a sufficient length of time (4 weeks or longer) consistently grew slowly and became anemic. This disorder was characterized by decreases in red blood cell count, percentage of hemoglobin in the blood, and red cell volume. The red blood cells were longer and wider and also less fragile than the normal. The anemia was not due to fasting. The blood of anemic chicks clotted in normal time. Less concentrated alcoholic extracts of liver gave inconsistent results, indicating the difficulty of preparing liver extract free of the antianemic agent. This unidentified factor is tentatively designated as vitamin B_c.

The detection of infertile eggs and its application to hatchery management, D. F. King (*Alabama Sta. Cir. 82 (1939), pp. 15, figs. 6*).—Principles underlying fertility determination in eggs, suitable candling machines, candling technic, precautions to be observed in the preheating of eggs and the cooling of preheated eggs, and the sale of incubated eggs for food are discussed.

Turkey management, S. J. Marsden and J. H. Martin (*Danville, Ill.: Interstate, [1939], pp. [8]+708, figs. [139]*).—A practical treatise on the breeding, feeding, management, and marketing of turkeys. The text comprises 16 chapters and an extensive appendix. Selected references to the literature are included at the end of each chapter.

Experiments show turkey poults need 4 times as much vitamin A as do chicks, H. S. Wilgus, Jr. (*Colo. Farm Bul. [Colorado Sta.], 2 (1940), No. 1, pp. 3, 4*).—Preliminary investigations gave evidence that turkey poults require about 600 units of vitamin A per 100 gm. of ration for maximum growth and

minimum mortality to 8 weeks of age. This is about four times the amount of vitamin A required by chicks. Practical sources of vitamin A for young turkeys under local conditions are discussed.

Precooling of poultry, W. H. Cook (*Food Res., 4 (1939), No. 3, pp. 245–258, figs. 2*).—Experiments were conducted at the National Research Laboratories, Ottawa, to determine the effect of various factors on the time required for precooling dressed poultry to a desired temperature. Based on the quantitative data thus obtained, equations are presented for relating the initial-product temperature, air temperature, and weight of the bird to the average time required for cooling to any required temperature above the freezing point. The relatively large residual variance after accounting for the effect of temperature gradient and weight by the derived equations indicates the importance of certain unknown properties of the product in determining the time required for precooling. Immersion in water at 45° F. for 2 hr. prior to hanging in air at 32° had little effect on the over-all time required for cooling, but cooling in water at 32° for 2 hr. reduced the total time to about 60 percent of that required in air alone. Cooling in air alone generally resulted in a small loss in weight, while immersion in water for 2 hr. resulted in an over-all gain in weight of variable magnitude. Immersion in water had no apparent beneficial or detrimental effect on retention of bloom during subsequent frozen storage.

Frozen storage of poultry, II, III (*Food Res., 4 (1939), No. 5, pp. 419–424, 433–440*).—Two additional reports in this series (E. S. R., 82, p. 669).

II. *Bloom*, W. H. Cook (pp. 419–424).—The loss of bloom in dressed poultry during frozen storage was found to depend mainly on the extent of evaporation, so low temperature and high humidity tended to preserve bloom. Little deterioration of the bloom could be detected in poultry stored in a package lined with sealed, water-resistant material at −13.5° C. for 50 weeks, but if the liner was unsealed, serious deterioration occurred in from 20 to 30 weeks at this temperature. Likewise, poultry in standard packs with unsealed liners showed significant loss in bloom during about 1 year's storage at −22°. Initial color of the poultry proved an important consideration, the lighter-colored, high-grade carcasses suffering less in appearance after storage than the more yellow "Selected" grades.

III. *Peroxide oxygen and free fatty acid formation*, W. H. Cook and W. H. White (pp. 433–440).—The free fatty acid content of poultry fat after storage varied between individual birds but was generally low and bore no apparent relation to storage conditions at freezing temperatures. Storage temperature was the most important factor affecting the rate of peroxide-oxygen formation, the amount increasing as temperatures increased. Low humidities also tended to accelerate this reaction, presumably the result of surface drying which exposed more fat to the air. The amount of peroxide formation was generally low, and rancidity of fat was not observed in any case, indicating that poultry fat is normally quite resistant to oxidation. Incipient changes indicated by the higher peroxide-oxygen values might have caused some loss or change of flavor.

Susceptibility of frozen-defrosted poultry meat to drip, C. H. Koonz and J. M. Ramsbottom (*Food Res., 4 (1939), No. 5, pp. 485–492, figs. 3*).—The results of two experiments are recorded. A study of the cooking shrinkage of frozen and unfrozen birds showed similar losses whether the carcasses were unfrozen or frozen at temperatures of −50°, −15°, or 8° F. Samples of ground white meat and ground dark meat were frozen at temperatures of −50° and 8° at 2–3 hr. and at 24 hr. after slaughter. The white meat showed a significantly greater susceptibility to drip when defrosted than the dark meat. The drip

from ground white meat frozen 2–3 hr. after slaughter bore little relationship to freezing temperature but that frozen at 24 hr. after slaughter dripped more when frozen at 8° than at −50°. The pH values of the dark meat averaged considerably higher than those for white meat.

DAIRY FARMING—DAIRYING

[Experiments with dairy cattle in Georgia] (*Georgia Sta. Rpt. 1939, pp. 49, 52, 53, 56, 57, figs. 2*).—Results are briefly reported on the value of ryegrass pasture for dairy cows, the effect of growth and development of supplementary concentrates for dairy heifers on summer pasture, the feasibility of grazing winter grains with dairy calves, and the relation of date of conception to the butterfat productivity of Jersey cows in Georgia and Maine.

[Investigations with dairy cattle and dairy products in Iowa] (*Iowa Sta. Rpt. 1939, pt. 1, pp. 89–91, 125–136, figs. 2*).—Progress reports (E. S. R., 81, p. 95) of experiments with dairy cattle, by C. Y. Cannon, D. L. Espe. B. H. Thomas, E. N. Hansen, and J. A. Schulz, include the relation of vitamin E to sterility in dairy cows, a comparison of roughages and the relation of roughage to grain in the dairy cow ration, the value of corn sugar in the grain ration of dairy calves, and the influence of the physical properties of milk on its rate of digestion in vivo.

From studies with dairy products, results are reported on micro-organisms causing surface taint in butter, *Pseudomonas fragi* and *P. mephitica* in dairy products, the development of butter cultures from mixtures of organisms, the methods of preparing butter cultures for mail shipment, and the importance of acetylmethylcarbinol and diacetyl in butter cultures, all by B. W. Hammer; the nitrogen metabolism of *Lactobacillus casei* cultures important in Cheddar cheese made from pasteurized milk, and the fat and protein metabolism of *Penicillium roqueforti* used in Iowa blue cheese, both by C. B. Lane and Hammer; the production of 2,3-butylene glycol in dairy products, by Hammer and C. H. Werkman; kinds of acids in butter and the distribution of these acids between the water and fat phases of butter, and the effect of neutralizers on fat losses in buttermilk and the quality of the butter, both by E. W. Bird; the standardization of Iowa dairy products, by M. Mortensen; and continuous vacuum pasteurization of cream as a means of eliminating feed and weed flavors and other defects of a seasonal character in cream intended for buttermaking, by N. E. Fabricius.

[Experiments with dairy cattle and dairy products in Maryland] (*Maryland Sta. Rpt. 1939, pp. 32–34, 35, 36, fig. 1*).—Investigations, for which results are briefly noted, include: The value of kelp meal in the ration of dairy heifers, input as related to output in milk production, the feeding value of distillers' rye slop for dairy cows, the effect of weather variations on the retail sale of ice cream (coop. U. S. D. A. et al.), and the use of annatto as a tracer in cream.

[Investigations with dairy cattle and dairy products by the Cornell Station] (*[New York] Cornell Sta. Rpt. 1939, pp. 108, 109, 110, 111, 113–115, 124–129*).—Brief progress reports (E. S. R., 81, p. 96) are presented for the following investigations, by L. A. Maynard, P. E. Johnson, E. S. Harrison, L. K. Lu, E. S. Savage, O. L. Lepard, E. Pagé, W. L. Nelson, C. M. McCay, G. H. Ellis, K. E. Gardner, A. L. Voris, J. R. Harrower, H. E. Newlin, E. S. Guthrie, and V. N. Krukovsky: The role of yeast vitamins in the growth and lactation of dairy cattle; the comparative value of mangel beets and dried beet pulp on the total digestible nutritive replacement basis; the use of molasses and phosphoric acid in making silage from legumes and grasses; the chemical changes which occur in phosphoric acid silage, and the effect of such silage on acid-base relationships

in the animal body; soybeans as a source of fat in dairy rations; fat tolerance and fat utilization in Herbivora; and the effect of cod-liver oil feeding on the secretion and properties of milk fat and on the ascorbic acid content of the milk.

From investigations with dairy products, by H. J. Brueckner, B. L. Herrington, D. B. Hand, H. Doob, Jr., R. F. Holland, H. E. Ross, Guthrie, P. F. Sharp, Krukovsky, O. Rahn, C. N. Stark, G. Knaysi, C. Lamanna, J. M. Sherman, I. C. Gunsalus, and C. F. Niven, Jr., results are briefly noted on the use of short-time high-temperature pasteurization, the chemistry and physicochemical properties of lactose, factors affecting the fat tests of preserved-milk samples, factors influencing the phosphatase test, determination of the oxygen content of milk, factors affecting the rate of oxidation of vitamin C in milk, the effect of moisture on the darkening of dried whey, lipase activity in milk, and the taxonomy, physiology, cytology, and morphology of various bacteria of importance in milk.

Owlrest's Alice—pride of the station Jersey herd, A. C. DAHLBERG (*Farm Res. [New York State Sta.], 6 (1940), No. 1, pp. 3, 13, fig. 1*).—A summary of the production and reproduction records of an outstanding 12-year-old Jersey cow, with a discussion of the predominant influence of her breeding on the station dairy herd.

Increasing the milk production of institutional herds, A. L. BEAM and C. S. McLEAREN. (*Pa. Expt. Sta.*). (*Holstein-Friesian World, 37 (1940), No. 1, pp. 11, 22*).—A résumé of management practices followed in highest-producing State institutional dairy herds, based on a study of 14 such herds.

A comparative study of the composition of the secretions (milk) obtained from the cow prior to and after calving, C. W. DOVER and V. SIVASUBRAMANIAN (*Agr. and Livestock in India, 9 (1939), No. 5, pp. 566–574, figs. 3*).—Data are presented on the composition of the prenatal secretion and colostrum of three cows, including two first-calf heifers and one older animal. The time of obtaining the first sample varied from 120 to 96 hr. before parturition. The most significant influence of prenatal milking on the composition of colostrum was a significant lowering of the globulin and ash contents as compared with the normal. Preliminary feeding trials with calves comparing colostrum from premilked and normally maintained cows indicated that milk from the former was inferior in nutritive properties, possibly due to a deficient supply of antibodies commonly associated with the globulin phase and of minerals.

[Mineral constituents of milk, I, II], B. N. ACHARYA and S. C. DEVADATTA (*Indian Acad. Sci. Proc., 10 (1939), No. 3, Sect. B, pp. 221–228, 229–235*).—Two papers are presented.

I. *Compounds of phosphorus in milk.*—Compounds of phosphorus in the acid-soluble and acid-insoluble portions of milk were determined, and the concentrations of the different types of phosphorus are presented in tabular form. Five independent types of phosphorus compounds in milk were recognized, including ortho, pyro, organic phosphorus compounds insoluble in barium hydroxide at pH 9, hydrolyzable and nonhydrolyzable organic phosphorus compounds soluble at pH 9, and the acid-insoluble casein and lipoid phosphorus.

II. *Phosphorus, calcium, and magnesium in milk.*—The total amounts of phosphorus, calcium, and magnesium present in the water-soluble, acid-soluble, and insoluble fractions and in the scum of milk are recorded. The water-soluble portion consisted of acid phosphates of calcium and magnesium. The acid-soluble, water-insoluble portion consisted of tricalcium and magnesium phosphates and organic phosphorus, and the acid-insoluble portion consisted mainly of casein which had adsorbed some ions of both calcium and magnesium.

The effect of increased iodine feeding upon the iodine content of cows' milk, N. L. MATTHEWS, G. M. CURTIS, and J. H. MEYER. (Ohio State Univ.).

(*Jour. Dairy Res.* [*London*], *10* (*1939*), *No. 3*, *pp. 395–402*, *fig. 1*).—Milk iodine and blood iodine were determined for a group of cows receiving a normal grain, hay, and silage ration and on a similar group receiving in addition 3.2 mg. percent of iodine as potassium iodide in the grain mixture. The blood iodine was greatly and uniformly increased by the iodine supplement in the ration. The milk iodine was also increased from 7 to 26 times that of milk from the control group. The amount of increase was principally dependent on the amount of iodine fed. However, during late spring and again in early fall the milk iodine from the iodized cows was relatively low. During 5 mo. in midsummer an average milk iodine content of 80 μg. percent was obtained from the iodized group.

The effect of light on the vitamin C of milk in different containers, J. Houston, S. K. Kon, and S. Y. Thompson (*Jour. Dairy Res.* [*London*], *10* (*1939*), *No. 3*, *pp. 471–474*, *figs. 2*).—In an experiment at the National Institute for Research in Dairying, milk obtained directly from the udder in the absence of light was placed in waxed paper containers; clear, brown, and green glass bottles; and in clear glass bottles wrapped in red cellophane. Determinations made after varying lengths of exposure to daylight (protected from direct sunlight) showed little destruction of ascorbic acid in the brown glass bottles, while destruction of this factor occurred at an increasing rate in the cellophane-wrapped, green glass, waxed carton, and clear glass containers. After exposure of 2 hr. or longer milk in the waxed carton contained approximately twice as much ascorbic acid as that in clear glass bottles.

The production and control of good flavor in milk, O. F. Garrett and C. B. Bender. (N. J. Expt. Stas.). (*Milk Plant Mo.*, *29* (*1940*), *No. 1*, *pp. 23–25*).—A popular discussion, based primarily on research previously noted (E. S. R., 82, p. 242).

The care and handling of milk, H. E. Ross (*New York: Orange Judd Pub. Co.*, *1939*, *2. ed.*, *rev. and enl.*, *pp. XV+417*, *figs.* [*66*]).—This is the second edition of this well-known text (E. S. R., 57, p. 178).

The sterilizing quality of chlorine solutions under different conditions, F. M. Scales and M. Kemp (*Jour. Milk Technol.*, *2* (*1939*), *No. 5*, *pp. 215–221*).—In the experiments recorded it was found that chlorine solutions had the greatest germicidal efficiency when adjusted to a pH of about 6. A solution containing 50 p. p. m. of available chlorine at pH 6 gave as satisfactory germicidal results as one containing 225 p. p. m. of chlorine at a pH of about 10. At pH 8 or under the solutions had better sterilizing properties at a temperature of 90° F. than at lower temperatures. Varying the temperature from 50° to 90° had little effect on the pH of the chlorine solutions, and within a pH range of 6 to 11 there was little decline in chlorine content during the 30-min. period. Acid sodium phosphate proved satisfactory for adjusting the pH to the desired level.

Testing of bottle-washing solutions, C. M. Moore (*Jour. Milk Technol.*, *2* (*1939*), *No. 5*, *pp. 227–235*, *fig. 1*).—A critical analysis of methods for testing milk bottle-washing solutions.

Bacteriology and mycology applied to dairying, A. T. R. Mattick, E. R. Hiscox, and J. G. Davis (*Jour. Dairy Res.* [*London*], *10* (*1939*), *No. 3*, *pp. 515–549*).—This biennial review (E. S. R., 78, p. 844) includes 374 references.

The enrichment of aerogenes-cloacae types in milk held at low temperatures, with observations on the relative rates of growth of aerogenes-cloacae and B. coli types in milk at different temperatures, J. F. Malcolm (*Jour. Dairy Res.* [*London*], *10* (*1939*), *No. 3*, *pp. 410–425*).—In an extensive series of experiments, including both pure and mixed cultures of coliform bacteria, it was found that *aerogenes-cloacae* types became enriched in milk

and multiplied much more rapidly than *B[acillus] coli* when incubated at relatively low temperatures.

Bacteriophage-organism relationships in the group of lactic streptococci, H. R. WHITEHEAD and G. J. E. HUNTER (*Jour. Dairy Res. [London], 10 (1939), No. 3, pp. 403–409*).—The occurrence of bacteriophage in cultures of lactic streptococci has been previously described (E. S. R., 76, p. 386; 81, p. 568). This article describes methods for the isolation and purification of such bacteriophages. Nine apparently distinct phage races are described. These phages showed a tendency toward strain specificity, but some races attacked up to four different strains. Cross-resistance tests indicated that the relationship between phages does not follow any simple rule.

The effect of pH on growth and gas production by streptococci and lactobacilli, J. G. DAVIS and C. C. THIEL (*Jour. Dairy Res. [London], 10 (1939), No. 3, pp. 455–463*).—This contribution from the National Institute for Research in Dairying presents data on the pH range and optimum pH for growth of 56 strains of streptococci and lactobacilli. The effect of pH on gas production is also indicated. It is concluded that the enterococci, *S[treptococcus] lactis* and *S. cremoris*, may be differentiated by their alkaline limits of growth.

A comparison of plate counts of raw milk on the old standard nutrient agar and on the new standard tryptone-glucose-extract-milk agar, C. A. ABELE and S. R. DAMON (*Jour. Milk Technol., 2 (1939), No. 5, pp. 222–226*).—One thousand samples of milk varying from very low to very high bacterial count were plated both on the old standard nutrient agar and on the new standard medium. About 70 percent of the samples showed increased counts, 7 percent unchanged, and 23 percent decreased counts on the new medium, the range of change extending from −55 to +1,718 percent. It appeared impossible to translate the count on one medium into terms of that on the other. The magnitude of variation suggested that there is no need for change in the average plate count limits now fixed in milk control legislation.

Application of resazurin test in determining quality of raw milk and cream, M. A. COLLINS, L. M. WHITE, W. H. CHILSON, H. G. TURNER, JR., and J. R. RICE (*Jour. Milk Technol., 2 (1939), No. 5, pp. 236–244, fig. 1*).—Tests conducted in two different laboratories gave evidence that 1 cc. of 0.005 percent resazurin dye mixed with 10 cc. of milk or cream makes a convenient and practical quality-control test and gives uniform results when carried out under definite and standardized conditions. There was a high agreement between resazurin pink and methylene blue reduction tests in selecting good-quality and poor-quality raw milk. The former required about one-half the time of the latter on patrons' shipments of raw milk, but approximately two-thirds as much time on tank car shipments. A rather definite relationship was found to exist between the time required for the reduction of resazurin to pink and the bacterial count of milk and cream.

On phosphatase methods in the control of long-time pasteurized and stassanized milk, A. JEPSEN and P. MADELUNG (*Jour. Milk Technol., 2 (1939), No. 5, pp. 254, 255*).—A critical comparison of the Stein, Kay and Graham, and Scharer methods from the Royal Veterinary College, Denmark.

The phosphatase test for control of efficiency of pasteurization, H. D. KAY, R. ASCHAFFENBURG, and F. K. NEAVE (*Milk Plant Mo., 29 (1940), No. 1, pp. 42, 44*).—A critical review of the development, modification, and application of the phosphatase test from the Imperial Bureau of Dairy Science, England.

Kay and Graham's phosphatase test: (a) Modifications in technique, (b) effect of bacterial growth, F. K. NEAVE (*Jour. Dairy Res. [London], 10 (1939), No. 3, pp. 475–484*).—Modifications of the Kay and Graham phosphatase test (E. S. R., 76, p. 91), which appreciably shorten the time required, are

outlined. The test appears to be unaffected by the presence of bacteria in milk unless the organisms are present in very large numbers.

A rapid phosphatase test: (a) Adaptation of Scharer's modification to pasteurizing conditions in Great Britain, (b) a study of factors influencing the reliability of the test, R. ASCHAFFENBURG and F. K. NEAVE (*Jour. Dairy Res.* [*London*], *10* (*1939*), *No. 3, pp. 485–497*).—An adaptation of the Scharer "field test" (E. S. R., 79, p. 99) is described in detail. This test proved accurate and well-adapted to British conditions of pasteurization, and required less than 1½ hr. for completion. Certain anomalies encountered in the application of the test are discussed.

A study of the effect of the growth of some organisms in milk on the phosphatase test, C. PALEY (*Jour. Milk Technol.*, *2* (*1939*), *No. 5, pp. 251–253*).—The growth and presence of numerous strains of bacteria in milk did not reactivate or increase the phosphatase enzyme to such an extent that it would interfere with the phosphatase test. Pasteurized milk kept at an incubation temperature of 37° C. for 5 hr. did not show a reactivation of phosphatase as measured by an increase of the enzyme.

Micro-organisms in butter and their relationship to quality, E. G. PONT (*Jour. Austral. Inst. Agr. Sci.*, *5* (*1939*), *No. 4, pp. 202–207*).—Summarizing the results of various experimental studies the author concludes that (1) there is at the most a poorly defined relationship between microbial population and the market grading of salted butter; (2) at storage temperatures of −10° C. or lower, changes in flavor of all types of butter are apparently entirely unrelated to microbial activity; (3) at temperatures above 0°, particularly in unsalted butter, marked degradation of quality may result from bacterial development; and (4) microflora of butter reflects the degree of general contamination during manufacture and is a reliable index of factory hygiene.

Bacteriology of butter.—VIII, Relationship of Achromobacter putrefaciens to the putrid defect of butter, T. J. CLAYDON and B. W. HAMMER (*Iowa Sta. Res. Bul. 267* (*1939*), *pp. 341–372, figs. 2*).—Continuing this series of studies (E. S. R., 82, p. 530), a number of samples of commercial putrid butter were examined in an effort to determine the causative organism. Using certain enrichment procedures and a modification of the Burri smear technic, as described, the typical form of *A. putrefaciens* or a variant form was isolated from 81 percent of the samples. In 13.8 percent the causative organism was not isolated, and only 5.2 percent yielded other types of organisms capable of producing objectionable odors. *A. putrefaciens* did not readily initiate growth on media. It was most easily isolated from putrid butter by inoculating the butter into thoroughly pasteurized cream, churning the cream, smearing the resulting butter on agar before the defect developed, and incubating the smeared plates at from 5° to 10° C. The organism was more readily isolated from fresh samples than from older ones. Following inoculation the typical putrid butter defect usually developed in unsalted butter in 1 day at 21° and in 7 days at 5°. The organism was active in creams varying from pH 5.2 to 7.8, but did not produce the defect when the pH of cream was 4.5. Salt tended to prevent the development of the organism in butter, but salting was not entirely effective unless the butter was thoroughly worked. The organism was isolated from the water supply in one plant having difficulty with putrid butter defect, thus suggesting one source of contamination.

The cause and prevention of mould in Canadian pasteurized butter, E. G. HOOD and A. H. WHITE (*Canada Dept. Agr. Pub. 570* (*1939*), *pp. 21, figs. 3*).—A general discussion, with specific recommendations for the prevention of mold in butter, which revises Bulletin 48 (E. S. R., 53, p. 676).

Bacteriology of cheese.—IV, Factors affecting the ripening of Swiss-type cheese made from pasteurized milk, F. J. Babel and B. W. Hammer (*Iowa Sta. Res. Bul. 264 (1939), pp. 201–252, figs. 4*).—Continuing this series of investigations (E. S. R., 80, p. 391), a number of Iowa Swiss-type, domestic Swiss, and Cheddar cheeses were examined for the presence of propionic acid bacteria. The Swiss-type cheese of good flavor contained relatively high counts of such bacteria, generally in excess of 100,000 per gram, while the majority of the samples of poor flavor contained less than 1,000 per gram. All of the domestic Swiss cheese contained rather large numbers of propionic acid bacteria. About 85 percent of the Cheddar cheese contained this type of organism, but there was no correlation between numbers of organisms and quality.

Eighteen strains of propionic acid bacteria isolated from various sources were used in the experimental manufacture of Swiss-type cheese from pasteurized milk. These cultures were added in varying amounts to the milk after pasteurization and were in addition to the usual amount of regular cheese culture. These cultures were variable in their effect on cheese flavor, but certain ones rather consistently produced cheese having excellent or good flavor. In general, those cultures producing the desirable sweet flavor were the ones which multiplied actively in cheese. Inoculation of about 25 cc. of such cultures per 100 lb. of milk gave about the desired intensity of sweet flavor. The addition of such cultures was not beneficial from the standpoint of eye production. Uninoculated cheese which developed good flavor invariably contained large numbers of propionic acid bacteria. A delay of 2 days in salting period resulted in slightly larger numbers of propionic acid bacteria and slightly more sweet flavor than with normal salting. Delaying salting until 7 days after manufacture resulted in higher counts of this organism and more sweet flavor and also in eyes extending nearer the surface. However, this practice caused the cheese to flatten. Inoculated cheese had a higher volatile acidity and higher acid number on the cheese fat than the controls. The degree of sweet flavor was rather directly related to the amount of volatile acids present.

There was little difference in the pH of the various experimental cheeses after 90 days of aging.

Lactic acid bacteria in relation to cheese flavour.—II, Observations on the inoculation of the milk employed in cheese manufacture with lactobacilli, I. R. Sherwood (*Jour. Dairy Res. [London], 10 (1939), No. 3, pp. 449–454*).—Continuing this series of studies (E. S. R., 78, p. 245), a convenient procedure for incorporating suitable strains of streptobacteria into mother cultures of cheese starter is described. The use of relatively small amounts of inocula of such cultures into cheese milk was most effective in improving cheese flavor. Large inocula generally imparted an undesirable sharpness to the flavor.

The bacterial flora of New Zealand Cheddar cheese, I. R. Sherwood (*Jour. Dairy Res. [London], 10 (1939), No. 3, pp. 426–448*).—From isolations made at the New Zealand Dairy Research Institute from 36 typical Cheddar cheeses, 720 strains of lactic acid bacteria were classified. The morphology and activity of the principal groups are described. *S[treptobacterium] plantarum* predominated, *S. casei* occurring much less frequently, and betabacteria and betacocci still less frequently. The betabacteria tended to replace *S. plantarum* in the final stages of cheese ripening, with an indication of a more regular gradation of flora during the ripening process than is generally recognized.

Factors affecting the solubility of milk powders.—IV, The influence of speed and duration of stirring on solubility, with a description of a rapid method for solubility determinations, G. R. Howat, J. A. B. Smith, R. Waite, and N. C. Wright (*Jour. Dairy Res. [London], 10 (1939), No. 3, pp. 498–514, figs. 7*).—Continuing this series of investigations (E. S. R., 72, p. 834), it was

found that alterations in the duration and speed of stirring exerted considerable effect on the apparent solubilities of milk powders. When powder was reconstituted in a 10 percent mixture, shaking for 30 sec. was sufficient to dissolve the truly soluble portion of the dried milk, but protein which had become denatured in drying tended to pass into the solution with increased speed and duration of stirring. A rapid method for estimating the solubility of milk powder on a total solids basis is described. The advantages of this method over the sediment test are discussed.

Preparation and use of low-lactose milk, P. H. Tracy and W. J. Corbett. (Univ. Ill.). (*Food Res., 4 (1939), No. 5, pp. 493–498*).—The method for the preparation of low-lactose milk consists briefly of (1) pasteurizing skim milk at 160° F. for 20 min., (2) adding to the milk while the temperature is being raised 3 oz. of a protein-destabilizing agent (Hygell) per 100 lb. of milk, (3) cooling pasteurized milk to about 90° and adding 1 pt. of a 10-percent solution of calcium chloride per 100 lb. of milk, (4) further cooling to 40°, (5) holding at low temperature until a separation of the casein and whey occurs (12–48 hr.), and (6) drawing off the lower layer (about one-fifth of the original volume) through the discharge valve. This lower portion contains largely the precipitated casein and the reduced percentage of lactose. The use of this low-lactose milk to replace a portion of the normal serum solids in the ice cream mix resulted in an ice cream which did not become sandy and which had a superior body and flavor. Other combinations of this material in ice creams and also possible commercial uses of the whey fraction are discussed.

Formulas for ice cream with reduced carbohydrate content, W. J. Corbett and P. H. Tracy (*Illinois Sta. Cir. 498 (1939), pp. 8*).—Formulas are presented for ice creams of low carbohydrate content for use on a commercial scale or in the home. Certain of these provide for the utilization of low-lactose milk, described above.

VETERINARY MEDICINE

The practice of veterinary medicine, D. H. Udall (*Ithaca, N. Y.: Author, 1939, 3. ed., rev., pp. IX+672, [pls. 3], figs. 99*).—The third revised edition of this work (E. S. R., 76, p. 243), in which the printed matter and illustrations have been increased about 20 percent.

Text-book of meat hygiene, with special consideration of antemortem and postmortem inspection of food-producing animals, R. Edelmann, rev. by J. R. Mohler and A. Eichhorn (*Philadelphia: Lea & Febiger, 1939, 7. ed., rev., pp. 463, pls. 5, figs. 157*).—A revised edition of this work (E. S. R., 70, p. 381).

[Contributions on veterinary medicine and physiology] (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 755, pp. 170–175, 180–185, 195–199, 200–209, 239–242, 260–262, 266–269, figs. 10*).—The following papers are included: A Histological Study of the Teat and Gland Cistern of the Bovine Mammary Gland, by C. E. Venzke (pp. 170–175) (Iowa State Col.); The Control of Bang's Disease in Dairy Herds, by W. E. Cotton (pp. 180–185) (Ala. Polytech. Inst.); Equine Infectious Anemia (=Swamp Fever), by W. L. Gates (pp. 195–199); Lameness Incident to Training and Racing of the Thoroughbred, by J. E. Peters (pp. 200–209); Duck Septicemia, by C. S. Gibbs (pp. 239–242); The Occurrence of the Guinea-Worm *Dracunculus medinensis* in a Dog and in a Mink, With a Review of This Parasitism, by E. A. Benbrook (pp. 260–262), and Infectious Gastroenteritis in Raccoons (=*Procyon lotor*), by E. F. Waller (pp. 266, 267, 268) (both Iowa State Col.); and Swine Erysipelas in a Week-Old Turkey Poult, by A. S. Rosenwald (pp. 268, 269) (Oreg. Expt. Sta.).

[Contributions on animal pathology and parasitology] (*N. Y. State Vet. Col. Rpt., 1937–38, pp. 53–210, pls. 20*).—*Contributions presented in this report* (E. S. R., 78, p. 99) *and not previously noted include the following*: The Teratology of the Bovine Reproductive System, by M. G. Fincher and W. L. Williams (pp. 53–67); A Study of the Intradermal Allergic Test for Brucellosis in Guinea Pigs, by D. R. Cordy (pp. 75–95); Blood and Urine in Uremia of the Dog (pp. 116–122) and Changes in the Blood of the Cow at Parturition (pp. 123–130), both by C. E. Hayden; The Basal Metabolic Rate of Chickens Affected With Fowl Paralysis, Transmissible Fowl Leukosis, and Certain Spontaneous Neoplasms, by C. Olson and H. H. Dukes (pp. 131–143); The Role of Allergy in Skin Diseases of Dogs, by H. J. Milks (pp. 149–154); The Physical Examination of the Eye of the Horse, by W. J. Gibbons (pp. 155–159); Species of Eimerian Coccidia Found in New York State Cattle, by D. W. Baker (pp. 160–166); and Egg Counting Technique for Use in the Diagnosis of Equine Strongylosis, by D. W. Baker and J. W. Britton (pp. 175–182).

[Contributions on animal pathology and bacteriology] (*Jour. Bact., 39 (1940), No. 1, pp. 31, 32, 39, 42, 43, 77, 93, 94*).—*Contributions presented at the annual meeting of the Society of American Bacteriologists held in December 1939*, abstracts of which are given, include the following: Antigenic Properties of a Purified Preparation of Bacteriophage, by J. Bronfenbrenner and G. M. Kalmanson (pp. 31, 32); Swine Pox, by R. E. Shope (p. 39); Experiments on the Rôle of Birds and Mosquitoes in the Epidemiology of Equine Encephalomyelitis, by W. A. Davis (p. 42); The Effect of Phagocytes on Eastern Equine Encephalomyelitis Virus, by J. E. Kempf and M. H. Soule (pp. 42, 43); Incidence of Members of the *Salmonella* Group in Rats, by M. Ostrolenk, M. T. Bartram, and H. Welch (p. 77) (U. S. D. A.); Studies on Staphylococci of Bovine Origin, by L. W. Slanetz and H. P. MacLeod (p. 93) (N. H. Expt. Sta.); and Some Observations on the Serological Typing of *Streptococcus agalactiae*, by W. N. Plastridge and L. F. Banfield (p. 94) (Univ. Conn.).

[Contributions on animal pathology and parasitology] (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 12 (1939), No. 1, pp. 9–18, 75–230, figs. 50*).—*Contributions presented* (E. S. R., 82, p. 251) *include the following*: The Preparation of Anthrax Spore Vaccines (for Cattle and Sheep) in South America, by M. Sterne and E. M. Robinson (pp. 9–18); South African Helminths—VI, Some Helminths, Chiefly From Rodents, by R. J. Ortlepp (pp. 75–101) (E. S. R., 81, p. 570); Further Notes on Species of Trichodectidae With Descriptions of New Species (pp. 103–119) (E. S. R., 78, p. 100) and Notes on Menoponidae (*Mallophaga*) With Descriptions of New Genera and Species (pp. 121–152), both by G. A. H. Bedford; The *Senecio* Alkaloids—I, The Isolation of Isatidine From *Senecio retrorsus* and *Senecio isatideus*, by H. L. de Waal (pp. 155–163); and Water Poisoning in Man and Animal, Together With a Discussion on Urinary Calculi, by D. G. Steyn and N. Reinach (pp. 167–230).

[Work in animal pathology and parasitology by the Bureau of Animal Industry] (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt., 1939, pp. 3–7, 31, 32, 39, 40, 41–82*).—The work of the year (E. S. R., 80, p. 819) referred to includes the detection and control of Bang's disease or brucellosis; tuberculosis; vesicular stomatitis; mastitis; leucosis (fowl paralysis); avian encephalomyelitis (epidemic tremor); hog cholera and its control; the use of disinfectants and of tuberculin; eradication of scabies; inspection and quarantine of animals and animal products; infectious equine encephalomyelitis; periodic ophthalmia; infectious anemia; swine erysipelas; anaplasmosis; stock-poisoning plants and their relation to bighead in sheep; tick eradication; parasites of horses, ruminants, swine, and other animals and of poultry; and treatment with commercial pheno-

thiazine and other preparations for the removal of parasites from poultry, sheep, and swine.

[Work in animal pathology and parasitology by the Colorado Station] (*Colorado Sta. Rpt. 1939, pp. 18, 42–45*).—A brief report is made of the work of the year (E. S. R., 80, p. 819) with poisonous plants, including *Suckleya suckleyana*, silky *Sophora*, *Bahia oppositifolia*, *Kochia scoparia* (fireweed), and *Oxytenia acerosa*; sheep losses due to parasites and coccidiosis; H-ion determinations of intestinal tracts of feeder lambs; studies of intestinal filtrates of lambs dying in the feedlots; urinary calculi; equine encephalomyelitis; goiter in chickens; and eye and throat lesions in turkeys due to vitamin A deficiency.

[Work in animal pathology and parasitology by the Iowa Station] (*Iowa Sta. Rpt. 1939, pt. 1, pp. 95, 155–160, 162*).—The work of the year (E. S. R., 81, p. 103) reported upon includes the etiology of range paralysis in poultry, by C. Murray, C. D. Lee, and H. L. Wilcke; breeding for resistance to fowl typhoid in poultry, by E. W. Lindstrom, J. W. Gowen, and N. F. Waters; genetic investigation of resistance and susceptibility to *Salmonella aertrycke* in mice, by Lindstrom and Gowen; and studies of Roentgen ray effects on the virus of neurolymphomatosis of the fowl, by Gowen.

[Work in animal pathology by the Maryland Station] (*Maryland Sta. Rpt. 1939, pp. 37–40, 70, fig. 1*).—The work of the year (E. S. R., 80, p. 819) reported upon includes udder infection with *Brucella abortus*, experiments with infectious enterohepatitis in turkeys, demonstration of pullorum resistance bred in a Maryland flock of chickens, bovine trichomoniasis, and the use of sulfapyridine in the treatment of Bang's disease.

Studies on the fate of selenium in the organism, M. I. SMITH, B. B. WESTFALL, and E. F. STOHLMAN (*Pub. Health Rpts. [U. S.], 53 (1938), No. 28, pp. 1199–1216, figs. 8*).—Studies conducted have shown that intravenously injected inorganic selenium leaves the blood stream slowly "to be selectively absorbed in certain tissues, mostly the liver and kidney, thence to be excreted chiefly by way of the kidney. The excretion level of selenium in the urine is higher in animals chronically poisoned with inorganic than when similarly poisoned with naturally occurring food selenium. There is far greater retention of selenium in the tissues of animals chronically poisoned with naturally occurring organic selenium than with inorganic selenium. After a 3- or 4-mo. period of poisoning with small doses of inorganic selenium, the element continues to be excreted in the urine for about a month. After a similar period of poisoning with like doses of naturally occurring organic selenium the element continues to be excreted in the urine for at least 6 mo., and probably longer. The selenium stored in the tissues in the course of chronic poisoning with organic selenium is, for the most part, in protein combination. A small amount of it is nonprotein, and it probably represents the end product or products of its metabolism. Most of the selenium in the blood and kidney in acute poisoning with relatively large doses of inorganic selenium is nonprotein, while some of the liver selenium appears to be in protein combination. In subacute poisoning with inorganic selenium there is evidence of a protein-selenium complex in all the tissues examined, especially in the liver. The urinary selenium in all cases is recoverable quantitatively by simple distillation with bromine-hydrobromic acid-sulfuric acid mixture. Little, if any, of the urinary selenium is in volatile form. It appears to consist of a relatively labile organic compound or compounds. Little, if any, inorganic selenium is demonstrable in animals chronically poisoned with organic selenium. In animals acutely poisoned by intravenous injection of inorganic selenium, up to 50 percent of the urinary selenium is recoverable by direct precipitation and is therefore regarded to be inorganic. In subacute poisoning with inorganic sele-

nium by oral administration some inorganic selenium is demonstrable in the urine, but not uniformly."

The persistence of the viruses of endemic (murine) typhus, Rocky Mountain spotted fever, and boutonneuse fever in tissues of experimental animals, C. B. PHILIP and R. R. PARKER (*Pub. Health Rpts.* [*U. S.*], *53* (*1938*), *No. 29, pp. 1246–1251*).—Report is made of observations on the survival of the viruses of endemic (murine) typhus, Rocky Mountain spotted fever, and boutonneuse fever in the brain, spleen, blood, and the tunica exudate of white rats, white mice, guinea pigs, and the Columbian ground squirrel (*Citellus columbianus*). "Endemic typhus virus, capable of producing frank infection in guinea pigs, was found to persist in white rats and white mice more consistently and for longer periods than in the same tissue of guinea pigs, or than the viruses of either Rocky Mountain spotted fever or boutonneuse fever in these animals. Of the tissues tested, namely, blood, spleen, tunica exudate, and brain, the last seemed to be the most favorable site for persistence. . . . Tests for persistence of Rocky Mountain spotted fever virus were made in series of white rats, white mice, and ground squirrels over periods of 270, 210, and 240 days, respectively. The only definitely positive test was with the brain of a white rat sacrificed 30 days after inoculation. No definite, positive result was obtained in any of the similar boutonneuse fever tests. It is suggested that persistence of endemic typhus virus in the brain of the white rat may be used as a supplemental aid in the differentiation of endemic (murine) typhus from certain other rickettsial infections."

The effects of injection into Bovidae of emulsions of Anaplasma-infected ticks, C. W. REES. (U. S. D. A.). (*Vet. Med.*, *35* (*1940*), *No. 1, pp. 20, 21*).—Two animals experimentally vaccinated with emulsions prepared from three ticks, namely, the cattle tick, *Boophilus annulatus australis*, and brown dog tick, developed anaplasmosis when injected with virulent blood.

Isolation of Cl. botulinus from oat grain, C. A. MITCHELL, R. V. L. WALKER, and D. G. MCKERCHER (*Canad. Jour. Compar. Med.*, *3* (*1939*), *No. 9, pp. 245–247*).—Through the feeding of laboratory animals a toxin was demonstrated as present in oat grain that had evidently produced disease in horses. This led to the detection of *Clostridium botulinum* type B in the oats.

Studies on the bionomics and control of the bursate nematodes of horses and sheep.—VII, The effect of some substances, used in the control of farm and household pests, on the free-living stages of sclerostomes, I. W. PARNELL (*Canad. Jour. Res.*, *17* (*1939*), *No. 9, Sect. D, pp. 187–204, figs. 11*).—A continuation of this series of studies (E. S. R., 81, p. 711). The work here reported has shown that some chemicals that give off gases are extremely lethal to sclerostomes, while others, known to be lethal to other forms of animal life, have a comparatively low lethal value or are useless against sclerostomes. Some substances known to be lethal to some forms of animal life are useless against sclerostomes, and some chemicals, although extremely lethal to sclerostomes, when added to fresh feces do not kill many of the larvae until they reach the third stage. "Under the conditions of these experiments para- and orthodichlorobenzene will sterilize about 400 times their weight of feces. Sodium fluoride will sterilize, on an average, approximately 150 times its weight of feces, but it is almost twice as effective if applied as a very weak solution. Sodium silicofluoride, which also is most effective as a very weak solution, probably has an approximately equal value. Naphthalene, when mixed in the feces, will sterilize about 270 times its own weight. Dichloropentanes will sterilize about 185 times their weight of feces. Forty percent nicotine sulfate will, on an average, sterilize approximately 14 times its weight of feces, but as a weak solution may be 5 or 6 times as effective. Ethylenedichloride, chloro-

form, and carbon tetrachloride will sterilize about 21, 18, and 12 times their weight of feces, respectively. Trisodium phosphate will sterilize only about 8 times its weight of feces. Tobacco dust will probably sterilize slightly over twice its weight of feces, but pyrethrum powder, derris powder, and white hellebore powder have no lethal value. Ferric oxide and carbon monoxide also are useless."

A list of 24 references to the literature is included.

A bacteriological study of 134 strains of Corynebacterium ovis, H. R. Carne (*Jour. Pathol. and Bact., 49 (1939), No. 2, pp. 313–328, pls. 2*).—A description is given of the morphological and cultural characters of 134 strains of *C. ovis*, the cause of pseudotuberculosis or caseous lymphadenitis, that were isolated from 133 Australian sheep and 1 cow. Certain strains were found to produce a hemolysin capable of giving rise to hemoglobinuria or icterus when inoculated into sheep, particularly by the intravenous route. "Hemolysis can be demonstrated in vitro in the depths of blood agar plates. It is increased by the presence of serum, unaffected by fermentable carbohydrate (glucose), and inhibited by the presence of free oxygen. The cells of various species of animals differ in sensitivity to the hemolysin, in the order guinea pig<rabbit<horse<sheep. Hemolysin is apparently closely linked with the bacterial cells and could not be demonstrated apart from them. It is apparently thermolabile and nonantigenic and appears to be unrelated to exotoxin. The capacity to produce hemolysin varies with different strains, and there is a tendency for mixed types of colonies to develop in subcultures from single colonies."

A list of 51 references to the literature is included.

The action of sulfanilamide on mastitis streptococci in vitro, J. O. Heishman and W. T. Miller. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 755, pp. 176–179*).—In work reported in continuation of that noted (E. S. R., 81, p. 839), "group B (Lancefield) streptococci of bovine origin were treated in vitro against various concentrations of sulfanilamide. In one experiment it was found that some strains of streptococci could survive concentrations of 800 mg. in 100 cc. (3.33 oz.) for 14 hr. and 200 mg. for 72 hr. at 38.5° C. It was evident, however, that the type of medium used for the test had some influence on the results. The effect of the incubation temperature was determined in a second experiment. As the temperature was increased, the bactericidal action of the sulfanilamide was enhanced. Considerable variation was observed in the ability of the different strains of streptococci to survive in varying concentrations of sulfanilamide under the same cultural conditions. Sulfanilamide treatment was given several cows, from which some of the strains of streptococci were isolated, but no correlation was noted between its action in vivo and in vitro."

Rocky Mountain spotted fever: Treatment of infected laboratory animals with immune rabbit serum, N. H. Topping (*Pub. Health Rpts. [U. S.], 55 (1940), No. 2, pp. 41–46, figs. 2*).—Report is made of the production of an immune serum in rabbits through use of tick virus of Rocky Mountain spotted fever as the antigen. The data presented show that its use after the onset of symptoms prevented the death of a large majority of the guinea pigs infected with the disease and of all of the four monkeys tested.

Standard strains of Salmonella, P. R. Edwards (*Kentucky Sta. Cir. 50 (1939), pp. 4*).—Announcement is made that the station has been designated as a National Salmonella Center by the International Salmonella Center at Köbenhaven (Copenhagen), Denmark, which was established at the State Serum Institute for the purpose of stimulating the study of organisms of the genus *Salmonella*, to assist in the identification of cultures, and to serve as a repository of standard strains. National centers have been established in a number of countries, and to these centers have been sent standard cultures and diagnostic

serums. In its new capacity the department of animal pathology of the station will undertake the identification of cultures of the genus *Salmonella* which are submitted to it for study, and it is prepared to supply standard strains to laboratories wishing to specialize in the study of the genus. A list is given of 100 recognized cultures, with their index number, identity, and antigen formulas.

Endemic typhus virus in mice, G. D. BRIGHAM (*Pub. Health Rpts.* [*U. S.*], *53* (*1938*), *No. 29, pp. 1251–1256*).—A review of the literature relating to the subject and a list of 14 references are presented. It is shown that "endemic typhus virus can be maintained in native field mice which are prevalent in the typhus area of Alabama. In the cotton mouse, the virus was transferred through 16 generations before it was lost. In old-field mice the virus has been carried through 36 passage generations. The virus has been found to survive 141 days in the cotton mouse, 141 days in the old-field mouse, and 76 days in the golden mouse, the extent of our experiment."

The incidence of contagious abortion in domestic animals in Egypt, M. RAGHEB AHMED (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 231* (*1939*), *pp.* [*1*]+*29*).

The standardization and interpretation of the agglutination test for Brucella infection in cattle, W. L. HINDMARSH (*Austral. Vet. Jour., 16* (*1940*), *No. 1, pp. 20–26*).—The need for a generally accepted standard for the performance and interpretation of the agglutination test for the diagnosis of *Brucella* infection of cattle is discussed.

Tuberculin reactions in cattle affected with Bang's disease, E. G. HASTINGS, J. R. MCCARTER, B. A. BEACH, W. WISNICKY, and J. S. HEALY. (Univ. Wis. and U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc., 96* (*1940*), *No. 755, pp. 186, 187*).—In order to determine whether infection with *Brucella abortus* sensitizes any considerable number of cattle to tuberculin and is partially responsible for the large number of nonvisible-lesion tuberculin-reacting cattle in Wisconsin, the authors tested the serums of tuberculin-reacting cattle for agglutinins for *B. abortus* and made tuberculin tests on cattle experimentally infected with this organism. The details are given in tables.

Foot-rot in sheep: A progress report on field trials, T. S. GREGORY (*Jour. Council Sci. and Indus. Res.* [*Austral.*], *12* (*1939*), *No. 4, pp. 330–338*).—Field experiments are said to have led to the conclusion that in the absence of a specific organism foot rot will not develop in healthy sheep when they are placed in the most favorable environmental conditions.

Control methods and anthelmintic treatments for ostertagiasis in sheep, W. L. THRELKELD. (Va. Expt. Sta.). (*Va. Acad. Sci. Proc., 1939, p. 29*).

Preparturient paresis in ewes, H. S. CAMERON and H. GOSS. (Univ. Calif.). (*Jour. Amer. Vet. Med. Assoc., 96* (*1940*), *No. 755, pp. 165–169, 170, fig. 1*).—In the experimental work reported "pregnant ewes were subjected to various environmental and dietary factors with the object of producing preparturient paresis or, at least, a blood picture showing a trend towards that found in the disease. Analyses of blood for sugar and plasma-alkali reserve were made periodically during gestation. No cases of the disease were produced. In comparing the group on a high-fat, no-exercise diet with the other three groups, a significant lowering of the alkali reserve was apparent. Blood-sugar and alkali-reserve levels in apparently normal animals based on 220 observations were established. Field investigations suggested that lack of exercise was a contributing factor and that glucose treatment, even when administered intravenously in the early stages, was valueless, although it reduced the acetonemia."

Pregnancy disease of sheep, C. ELDER and A. W. UREN (*Missouri Sta. Bul. 412* (*1940*), *pp. 16, figs. 5*).—A revision of Bulletin 345 (E. S. R., 72, p. 840).

Studies on fly strike in Merino sheep, I–III, D. A. GILL and N. P. H. GRAHAM (*Jour. Council Sci. and Indus. Res.* [*Austral.*], *12* (*1939*), *Nos. 1, pp. 53–82, figs. 2; 4, pp. 319–329, figs. 3*).—In part 1 of this contribution (pp. 53–70) the authors deal with the effect of Mules' operation on the incidence of crutch strike in ewes; part 2 (pp. 71–82), with miscellaneous observations at Dungalear on the influence of conformation of the tail and vulva in relation to crutch strike; and part 3 (pp. 319–329), with the influence of fly strike and conformation on body weight and fleece weight of Merino sheep at Dungalear, New South Wales.

A new dressing for fly struck sheep, M. R. FRENEY and N. P. H. GRAHAM (*Jour. Council Sci. and Indus. Res.* [*Austral.*], *12* (*1939*), *No. 4, pp. 311–318*).—A dressing known as C. B. E. (camphor-boracic emulsion), consisting of potassium hydroxide 4.1 percent, boric acid 10.05, oil of camphor 13.2, oleic acid 2.5 percent, and water to make 100 percent, was tested on a large number of fly struck sheep in the field and proved as satisfactory as glycerine-diboric dressing. It penetrates wool much more readily.

[**Work by the Georgia Station on internal parasites of sheep**] (*Georgia Sta. Rpt. 1939, pp. 59, 60*).—Reference is made to the important parasites of sheep, particularly the stomach worm (*Haemonchus contortus*) and the nodular worm (*Oesophagostomum columbianum*), and means of control.

A preliminary note on the anthelmintic efficiency of phenothiazine against Trichostrongylus spp. in sheep, H. McL. GORDON (*Jour. Council Sci. and Indus. Res.* [*Austral.*], *12* (*1939*), *No. 4, pp. 345–347*).—Experiments with phenothiazine administered in capsules in doses of 0.6 gm. per kilogram of body weight showed a very high degree of efficiency against *Trichostrongylus* spp. in sheep. "When the dose was reduced to 0.3 gm. per kilogram body weight, the degree of efficiency obtained was also reduced, but was satisfactory in 9 out of 11 sheep treated (i. e., it reduced egg counts by 70 percent or more). Further reduction of the dose to 0.15 gm. per kilogram body weight resulted in a marked decrease in degree of efficiency."

Efficacy of recrystallized phenothiazine for the removal of nematodes from the gastrointestinal tract of sheep, R. T. HABERMANN and P. D. HARWOOD. (U. S. D. A.). (*Vet. Med., 35* (*1940*), *No. 1, pp. 24–29*).—In studies reported, the details of which are given in tables, recrystallized phenothiazine in doses of 20 gm. per sheep weighing more than 70 lb. proved very effective for the removal of nodular worms (*Oesophagostomum columbianum*), common stomach worms (*Haemonchus contortus*), and lesser stomach worms (*Ostertagia* spp.). In doses of 25 gm. it also exhibited a high efficacy for the removal of the hookworm *Bunostomum trigonocephalum* and the large-mouthed bowel worm *Chabertia ovina*, and apparently was fairly effective for the removal of the small trichostrongyles (*Trichostrongylus* spp.) and *Cooperia* spp.

Chemical studies in connexion with the dosing of sheep with phenothiazine, M. LIPSON (*Jour. Council Sci. and Indus. Res.* [*Austral.*], *12* (*1939*), *No. 4, pp. 342–344*).—Methods for (1) the purification of commercial phenothiazine and (2) the quantitative estimation of phenothiazine in sheep's feces are described.

Coal-tar-pitch poisoning in pigs, R. GRAHAM, H. R. HESTER, and J. A. HENDERSON. (Univ. Ill.). (*Jour. Amer. Vet. Med. Assoc., 96* (*1940*), *No. 755, pp. 135–140, figs. 3*).—Several separate outbreaks of an uncommon disease of young pigs characterized by gross lesions of degeneration of the liver, which were brought to the attention of the Illinois Experiment Station, led to the investigation here reported. On two of the four farms where the rapidly fatal disease occurred, naturally affected pigs had access to pasture on which remnants of clay targets or expended clay pigeons were found. Remnants of the clay pigeons

collected from one of the farms when mixed with wholesome rations and fed to healthy pigs produced gross and microscopic hepatic changes indistinguishable from those observed in naturally affected animals. Since one of the chief ingredients of clay-pigeon targets is coal-tar pitch, commercial coal-tar pitch was fed to healthy pigs. Symptoms, mortality, and gross and microscopic degenerative liver lesions resembling the spontaneous disease were thus induced. The results of the investigation indicate that coal-tar pitch poisoning may be responsible for such spontaneous outbreaks of liver degeneration in pigs.

A method of immunization with crystal violet vaccine against hog cholera.—Preliminary report, T. Topacio (*Philippine Jour. Anim. Indus., 6 (1939), No. 5, pp. 341–352*).—Description is given of a method found satisfactory in the immunizing of pigs against hog cholera with crystal violet vaccine as demonstrated in two experiments. The dose which confers absolute immunity or 100-percent protection was found to be 1 cc. per 5 lb. of body weight under laboratory conditions. This is said to be a larger dose than that used by McBryde and Cole in their work (E. S. R., 76, p. 539), which was from 5 to 10 cc. per 40 to 90 lb. of body weight.

A bacteriological study of the aerobic flora occurring in pneumonic lungs of swine, F. Thorp, Jr., and F. W. Tanner. (Colo. Expt. Sta. and Univ. Ill.). (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 755, pp. 149–159, 160*).—Following a review of the literature presented in connection with a list of 25 references, report is made of bacteriological tests conducted. The findings are summarized as follows: "Yeasts were not isolated from any of the 204 swine lungs examined. One streptococcus culture was isolated from 1 of 38 apparently normal lungs. No micro-organisms were isolated from 47 lungs exhibiting various lesions of pneumonia. One hundred and fifty-three isolations of bacteria were made from 119 pneumonic lungs. In this investigation pneumonia in swine occurred more often as a secondary than as a primary condition. In frequency of occurrence the following genera and groups of micro-organisms were isolated: Streptococci, pasteurellae, miscellaneous Gram-positive and Gram-negative rods (probably contaminants), *Alcaligenes*, diplococci, and one *Staphylococcus*. The alpha type of streptococci was isolated far more frequently than the beta type. The alpha streptococci were divided arbitrarily into 4 groups [and] the pasteurellae . . . into 2 groups on the basis of fermentation reactions. Agglutination tests upon 3 groups of alpha streptococci and upon the diplococci showed some serological relationship among members within the group. Agglutination tests upon the pasteurellae were not entirely satisfactory for correlating the relationship of members of this genus. Moulds and actinomyces, as judged by colonies appearing upon the mediums used in primary isolations, were not considered of significance in swine pneumonia."

Avian tubercle bacilli in tonsils of swine, W. H. Feldman and A. G. Karlson (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 755, pp. 146–148, 149*).—The bacteriological examination of a tonsil from each of 94 swine carcasses obtained from federally supervised abattoirs resulted in the finding of the tubercle bacillus in 23.4 percent. Fourteen of the 22 strains secured were from carcasses that were tuberculous, and 8 were obtained from carcasses without gross signs of tuberculosis. By tests for pathogenicity in which guinea pigs and rabbits were used, each of the 22 strains was identified as *Mycobacterium tuberculosis avium*. Lesions of tuberculosis were found in the contiguous lymph nodes of 42 of the carcasses, but not in the remainder.

Dose rates and blood concentrations of sulphanilamide in horses, P. L. Bazeley, R. Jokobowicz, and B. Splatt (*Austral. Vet. Jour., 15 (1939), No. 5, pp. 199–205, figs. 5*).—Determination was made of the concentrations of sulfanilamide produced in the blood of a horse by various doses per pound of body

weight. From the data obtained a table has been constructed showing the doses by which different minimal concentrations of sulfanilamide can be attained. Concentrations up to 10 mg. per 100 cc. blood caused no toxic effects.

The control of strongyles in horses, G. W. SALISBURY, D. W. BAKER, and J. W. BRITTON ([*New York*] *Cornell Sta. Rpt. 1939, pp. 116, 117*).—Methods of control are reported.

Treating horse-stable manure with steam to kill parasite eggs and larvae, J. T. LUCKER. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 755, pp. 188–194, figs. 2*).—In the work reported, the boiler horsepower was found insufficient, even in warm weather, for dependable, rapid, and complete sterilization of horse manure steamed in boxes of about 145-cu. ft. capacity. Steaming the manure "for 1.5 to 6.5 hr. evidently killed practically all of the eggs and larvae located centrally in these boxes, but usually did not kill those in the manure near the sides and corners of the boxes. In three of nine tests in these boxes the sterilization was apparently complete, but no satisfactory index for control of the duration of the steam treatment was evident from the data of these tests. The concept of effective duration of steaming time afforded a practical method of controlling the steaming process in tests in a box of about 91-cu. ft. capacity. In only two of eight tests in which effective temperatures were reached were any infective larvae recovered from cultures of the steamed feces. The effective steaming time varied from 10 to 35 min. Several tests in this box were controlled by means of a single, inexpensive, industrial type temperature gage entering one side of the box near the bottom. A temperature of 95° C. at this point was regarded as initiating the effective treatment. In completely successful tests the total steaming time varied from 1.5 to a little over 2.5 hr. In most of the tests in this box the flow of steam was regulated by alternate open and reduced settings of the valve at the boiler. The ascarid eggs present in the manure in two tests were killed by the steam treatment. Tests in this box were successfully carried out in nearly freezing weather."

Studies in canine coccidiosis, F. X. GASSNER. (Colo. State Col.). (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 755, pp. 225–229, figs. 2*).—Report is made of an examination of 320 dogs taken from the surgical and medical wards of the Colorado State College veterinary hospital. An unusually high incidence of coccidia carriers (79 percent) was found. "This finding was probably due to repeated routine fecal examination of a series of animals, together with refinements in technic and examination which are not often executed in their entirety. The drug, arecoline hydrobromide, was found to be useful in the study of canine coccidiosis. Since this compound may change the chronic type of coccidiosis to the acute type, especially in young dogs, its limitations as a therapeutic agent should be made in the case of each animal prior to medication. Data are presented to show that the sporocysts of *Isospora bigemina* and sometimes the sporocysts of *I. rivolta* are discharged into the intestinal lumen in a mature stage. This finding would indicate that infection could take place from *I. bigemina* immediately upon contact with freshly voided feces."

The immunizing potency of antirabies vaccines: A critical review, L. T. WEBSTER (*Amer. Jour. Hyg., 30 (1939), No. 3, Sect. B, pp. 113–134*).—This review is presented with a list of 31 references to the literature.

Streptococcic infections in dogs.—II, Pathogenicity, "acid milk," convulsions, tonsillitis, abscesses, conjunctivitis, and skin contamination, H. J. STAFSETH. (Mich. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 755, pp. 230–235*).—A continuation of this study (E. S. R., 77, p. 545).

The efficacy of n-butyl chloride for the removal of intestinal nematodes, especially whipworms, from dogs, P. D. Harwood, A. C. Jerstad, P. C. Underwood, and J. M. Schaffer. (U. S. D. A.) (*North Amer. Vet., 21 (1940), No. 1, pp. 35–41*).—Further work with n-butyl chloride as an anthelmintic, first reported upon by W. H. Wright and J. M. Schaffer,[a] and later by Harwood, Underwood, and Schaffer (E. S. R., 81, p. 423), the details of which are given in tables, has shown that at a dose rate of 1 cc. per kilogram it is approximately 60 percent effective for the removal of whipworms from dogs weighing more than 11 kg. but less effective for dogs weighing less than 11 kg. In relatively small doses it is very effective for the removal of ascarids and hookworms from dogs. Since the administration of n-butyl chloride to dogs has not been followed by a toxic manifestation in an extended series of experiments, this drug is suggested as a substitute for tetrachloroethylene. A suggested schedule of doses is given.

Anaplasmosis among deer in the natural state, W. H. Boynton and G. M. Woods. (Univ. Calif.). (*Science, 91 (1940), No. 2355, p. 168*).—The inoculation of a young cow with pooled blood from several Columbian black-tailed or coast deer (*Odocoileus hemionus columbianus*) killed on a ranch in the foothill area of Mt. Hamilton, Calif., where sporadic outbreaks of anaplasmosis had occurred, was followed by the appearance of the marginal points in the red blood cells on the forty-second day and by typical symptoms of the disease. The Pacific coast tick, previously incriminated by Boynton and his associates (E. S. R., 75, p. 254) as a transmitter of the infection, was found attached to the affected deer. These findings lend support to the reports of du Toit (E. S. R., 74, p. 393) of the transmission of anaplasmosis to antelope and of Boynton and Woods (E. S. R., 70, p. 829) that deer become carriers following the injection of infective blood and the suggestion that in the natural state they afford a potential reservoir of the infection.

Shock disease as the cause of the periodic decimation of the snowshoe hare, R. G. Green, C. L. Larson, and J. F. Bell. (Univ. Minn., U. S. D. A., et al.). (*Amer. Jour. Hyg., 30 (1939), No. 3, Sect. B, pp. 83–102, figs. 2*).—This detailed report of an investigation of the so-called shock disease of the snowshoe hare, earlier references to which have been noted (E. S. R., 80, p. 402), is presented with a list of 24 references to the literature. The failure to discover any parasitic infection or infectious disease of microbic or ultramicrobic origin sufficiently prominent during the decline in the number of hares to be considered causal, and the finding of the disease to involve almost the entire hare population in the several areas of Minnesota studied have led to the conclusion that this disease of undetermined etiology is the mortality factor that brings about the periodic decimation of the snowshoe hare. Accessory field investigations pursued from Hudson Bay to the Gulf States have yielded findings which favor the view that shock disease is responsible for the destructive phase of the hare cycle throughout the northern regions of America.

Haemobartonella n. g. (Bartonella olim pro parte), H. microti n. sp. of the field vole (Microtus pennsylvanicus), E. E. Tyzzer and D. Weinman (*Amer. Jour. Hyg., 30 (1939), No. 3, Sect. B, pp. 141–157, pl. 1, figs. 2*).—It is proposed that some of the members of the genus *Bartonella* be separated to comprise a new genus to be known as *Haemobartonella*. The genus *Bartonella* will include forms which multiply in fixed tissue cells as well as in the blood and which produce nodular eruptions, and *Haemobartonella* will include those in which there is no demonstrable multiplication outside the circulating blood and which do not produce cutaneous growths. The name *H. microti* is given to a new species described from the field vole (*M. pennsylvanicus pennsylvanicus*). Some of

[a] Amer. Jour. Hyg., 16 (1932), No. 2, pp. 325–428, figs. 2.

the affinities of organisms of the genera *Anaplasma*, *Eperythrozoon*, *Bartonella*, *Grahamella*, *Rickettsia*, *Cytoecetes*, and *Aegyptianella* are pointed out. A list of 28 references to the literature is included.

[Contributions on avian pathology and parasitology] (*Vet. Med., 34 (1939), No. 12, pp. 693–710, 714–721, 728–730, 734–753, 754–772, figs. 34; 35 (1940), Nos. 1, pp. 35–58, figs. 10; 2, pp. 98–102, 103–116, 124–127, figs. 7*).—Contributions presented relating to diseases of domestic and game fowl are as follows:

No. 12.—The Value of Accurate Diagnosis of Poultry Diseases, by C. P. Fitch and B. S. Pomeroy (pp. 693–697) (Minn. Expt. Sta.); The Diagnosis of Poultry Diseases, by M. J. Twiehaus (pp. 698–710) (Kans. Sta.); Poultry Flock Sanitation, by W. W. Thompson (pp. 714–721) (Kans. State Col.); The Importance and Nature of Non-Specific Pathological Conditions in Laying Chickens, by J. R. Beach (pp. 728–730) (Univ. Calif.); Tuberculosis of Chickens, by W. H. Feldman (pp. 734–742); Laryngotracheitis, by F. R. Beaudette (pp. 743–747) (N. J. Stas.); Lymphomatosis and Leucosis, by E. L. Stubbs (pp. 748–750); Fowl Pox, by J. W. Lumb (pp. 751–753) (Kans. State Col.); Infectious Avian Encephalomyelitis, by H. Van Roekel, K. L. Bullis, and M. K. Clarke (pp. 754, 755) (Mass. Sta.); Enterohepatitis in Turkeys, by A. J. Durant (pp. 756–759) (Univ. Mo.); Botulism of the Domesticated Fowl, by J. L. West (pp. 760–762); Tapeworm Infestation in Poultry, by H. J. Stafseth (pp. 763–765) (Mich. State Col.); Control of Common External Parasites of Chickens, by M. W. Emmel (pp. 766–768) (Fla. Sta.); and An Evaluation of Poultry Biologics, by C. D. Carpenter (pp. 769–772).

No. 1.—Pullorum Disease Control and Eradication, by H. Van Roekel (pp. 35–41) (Mass. Sta.); The National Plan for the Control of Pullorum Disease, by H. Bunyea and P. B. Zumbro (pp. 42–45) (U. S. D. A.); Incubator Hygiene, by R. Graham and H. R. Hester (pp. 46–51) (Univ. Ill.); and Nematodes of Domestic Fowls Transmissible to Wild Game Birds, by E. E. Wehr (pp. 52–58) (U. S. D. A.).

No. 2.—The Avian Embryo—A Valuable Aid in Disease Study, by C. A. Brandly (pp. 98–102) (U. S. D. A.); Trichomoniasis in Turkeys, by L. D. Bushnell and M. J. Twiehaus (pp. 103–105) and The Large Roundworm of Chickens, by J. E. Ackert (pp. 106–108) (both Kans. Sta.); Nicotine in the Control of *Ascaridia lineata* in Fowls, by D. E. Davis (pp. 109–111); Paratyphoid Infections in Birds, by E. Jungherr (pp. 112–116) (Univ. Conn.); and Diseases of Game Birds, by J. E. Shillinger and D. R. Coburn (pp. 124–127).

Experiments on absorption in the crop of the chicken, E. E. Leasure and V. D. Foltz. (Kans. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 755, pp. 236–238*).—The authors' findings based on experiments with a small group of hens indicates that botulinus toxin is not absorbed through the crop of this fowl.

Observations on the etiology and control of fowl paralysis, J. W. Johnston and J. E. Wilson (*Vet. Jour., 95 (1939), No. 12, pp. 474–485*).—Experiments relating to the influence of environmental factors on the incidence of fowl paralysis are reported. It is shown that "when newly hatched chicks were taken from the original plant, where the disease was prevalent, and reared on fields where poultry had not previously been kept, the mortality was very much lower than in the case of closely related birds reared in the original plant. The disease appeared in birds hatched from eggs obtained from a stock free from disease but reared in the original plant. Isolation, though proved by the appearance of coccidia to be incomplete, was effective in reducing the incidence of the disease and postponing the onset of symptoms." The results obtained suggest that the disease is infectious and can be controlled by methods of management specially designed for that end.

Serological relationship between Salmonella pullorum and the lactobacilli sp.—Preliminary report, M. POLLARD. (Va. A. and M. Col.). (*Va. Acad. Sci. Proc., 1939, p. 68*).—It was found that lactose broth suspensions of *Lactobacillus casei* injected parenterally into negative turkeys and chickens induced a positive agglutination reaction with *S. pullorum* antigen up to a titer of 1/200. Note is made of the necessity of adjusting the pH of the antigen to that of normal fowl blood.

A method of raising turkeys in confinement to prevent parasitic diseases, E. P. JOHNSON (*Virginia Sta. Bul. 323 (1939), pp. 16, figs. 3*).—A method of raising turkeys in confinement protected from disease-carrying flies, developed in the course of work conducted over a 3-yr. period, is considered. The method described is effective in preventing practically all of the parasitic infestations common to turkeys, including blackhead, coccidiosis, gapeworms, roundworms, and tapeworms, as well as the blood protozoan *Leucocytozoon smithi* transmitted by blackflies (*Simulium nigroparvum* (Twinn)) as reported upon by the author and his associates (E. S. R., 79, p. 687) and by Underhill (E. S. R., 82, p. 653). A detailed description of the turkey shelters used, with drawings, photographs, and bill of materials, is included. Tables, with data on comparative monthly feed consumption of the turkeys in confinement and of those in open lots, as well as comparative results on numbers of turkeys that died or were killed during the experiments, are given and discussed. Considerable emphasis is placed upon a leg deformity spoken of as hock disease, perosis, or slipped tendons, which was prevalent among the confined turkeys in the first 2 years' experiments. A separate experiment involving 25 turkeys and an equal number as check or controls was performed to test out the value of fresh green alfalfa as a preventive for slipped tendons of turkeys, but the results indicate that some other factors are of more importance. These were found to be in the order of importance as follows: (1) A relatively large amount of manganese for birds under these conditions, at least 1 lb. per ton of mash used as feed, (2) a reduction of bonemeal or meat scraps in the mash to decrease the phosphorus in the ration and a reduction in calcium by reducing the amount of soluble oystershells used, and (3) an increase in the amount of cod-liver oil used. The mash used should contain at least 1.5 percent of a fresh oil containing at least 85 A. O. A. C. chick units of vitamin D per gram.

Maximum and minimum temperatures, as well as humidity, within the shelters were recorded. The temperature in the shelters sometimes reached 20° F. higher than that outside. When this occurred simultaneously with relatively high humidity the birds appeared somewhat uncomfortable, but at no time did this seem to reduce their appetites nor to produce any losses. That the shelters be placed on high ground where they are exposed to wind from all angles, however, and that sheet metal roofs covered with aluminum paint be used, are considered advisable. The results of these experiments prove that turkeys can be raised according to the method described, without loss from any of the common parasitic diseases that affect turkeys. The slipped tendons that were troublesome in the earlier experiments may be prevented, according to the results of the last year's work. The method is practicable, and over a period of years should keep the turkey grower on a relatively safe basis as compared with the hazards involved from parasites when turkeys are grown in the conventional manner.

Fowl typhoid in turkey poults, E. P. JOHNSON and M. POLLARD. (Va. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 755, pp. 243, 244*).—The finding of *Shigella gallinarum* in the ovaries of adult turkeys from a flock that produced the affected poults here reported upon is considered to be presumptive evidence that the poults came from infected eggs. This outbreak of

fowl typhoid was of a chronic nature in the adult birds, and the organism involved seemed to be of very low virulence. In the poults the course was acute and had all the characteristics of an acute septicemia. "A later extensive outbreak among poults 6 to 12 weeks of age was of an acute nature and indicated the presence of a highly virulent organism for these birds. By testing at frequent intervals with pullorum antigen the percentage of positive reactors was reduced only from 8.7 percent to 6 percent, and it seems doubtful that all infection could have been eliminated by this method."

Studies on the cultivation of vaccinia on the chorio-allantoic membranes of chick embryos, W. D. H. STEVENSON and G. G. BUTLER ([Gt. Brit.] *Min. Health, Rpts. Pub. Health and Med. Subjs. No. 87 (1939), pp. 185, pls. 16, figs. 18*).—A report of studies extending over a long period of years.

The encephalitogenic property of herpes virus, K. ANDERSON (*Science, 90 (1939), No. 2343, p. 497*).—A description is given of an increase in virulence for chick embryos and a reduction in virulence for rabbits that have occurred in a neurotropic strain of herpes simplex during 70 serial passages on the chorio-allantois of chick embryos.

Attempts to obtain passive immunity in avian malaria with blood serum and spleen, R. HEGNER and M. DOBLER (*Amer. Jour. Hyg., 30 (1939), No. 3, Sect. C, pp. 81–91, figs. 4*).—Report is made of six experimental attempts to confer a passive immunity upon canaries with serum or spleen from canaries infected with *Plasmodium cathemerium*. The donors in every experiment were infected with the same strain of *P. cathemerium* as that later inoculated into the clean birds. The evidence is considered to favor the conclusion "that the birds into which serum or spleen from infected birds was injected were protected to a slight degree, but that the specific protective substances in both the serum and spleen were present in very low concentration."

Studies on Haemoproteus sacharovi of mourning doves and pigeons, with notes on H. maccallumi, G. R. COATNEY and E. WEST (*Amer. Jour. Hyg., 31 (1940), No. 1, Sect. C, pp. 9–14, pl. 1*).—The finding of the blood parasite *H. sacharovi* in the nestlings and *H. maccallumi* in the immature mourning doves (*Zenaidura macroura carolinensis*) at Peru, Nebr., is considered to justify the conclusion that some mourning doves acquire their hemoproteus infections in the North. Natural infections of *H. sacharovi* are reported for the first time from the common pigeon (*Columba livia*).

Studies on Plasmodium relictum in the pigeon.—I, Periodic phenomena of the asexual cycle, G. R. COATNEY (*Amer. Jour. Hyg., 31 (1940), No. 1, Sect. C, pp. 15–18, figs. 2*).—A description is given of the system used in raising pigeons free of blood-inhabiting organisms, and a report is made of studies of the periodic phenomena of the pigeon strain of *P. relictum* in 21 birds.

Morphological differences in Plasmodium relictum in canaries and ducks (Anas boschas domestica), F. WOLFSON (*Amer. Jour. Hyg., 30 (1939), No. 3, Sect. C, pp. 123, 124, figs. 7*).—Report is made of a study of the matinal strain of *P. relictum*, the morphology and general behavior of which in canaries has been described by the author.[7] This strain was inoculated into a domestic duck and was successfully passed through over 13 transfers involving more than 35 ducks.

A coliform intermediate from diseased quail, T. DURFEE and M. W. LERNER (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 755, pp. 245, 246*).—Report is made of a study of the bacterial flora in quail dying from an unknown disease. Strains of organisms representing the genera *Proteus*, *Pseudomonas*, *Alcaligenes*, *Aerobacter*, and *Escherichia* were isolated and identified, and a strain of *E. freundii* was investigated and the shifting of its biochemical reactions observed. This

[7] Amer. Jour. Hyg., 25 (1937), No. 1, pp. 177–186, figs. 2.

organism appears to be the cause of this disease of quail, Hungarian partridge, and pheasants as it occurred periodically in a large State-controlled game farm in New Jersey.

Nematodes of domestic fowls transmissible to wild game birds, E. E. Wehr. (U. S. D. A.). (*Vet. Med., 35 (1940), No. 1, pp. 52–58*).—Attention is called to the serious and even fatal parasitisms that occur in wild game birds when permitted to associate with domestic fowl. Among the nematodes that may thus be communicated from barnyard fowl to wild game birds are gapeworms and crop worms, acquired by quail from chickens and turkeys; stomach worms, by grouse, quail, pheasants, and pigeons from guinea fowl, turkeys, and chickens; and intestinal worms, including ascarids, trichostrongyles, *Heterakis*, and *Capillaria*, acquired by grouse, prairie chickens, quail, and doves from various domestic birds.

AGRICULTURAL ENGINEERING

[Engineering investigations of Colorado Station]. (Coop. U. S. D. A.). (*Colorado Sta. Rpt. 1939, pp. 22, 23, 37–41*).—Development of a "single seed ball" planter for sugar beets giving 22 percent more singles than were obtained with a standard commercial planter, trials of a disk furrow opener which resulted in distinctly greater initial germination than was obtained by means of a shoe furrow opener, the design of a multiple disk press wheel which gave significantly greater initial germination stands than standard commercial press wheels produced, and progress in the replacement of thinning with a long-handled hoe by a mechanical tool method are briefly noted.

In the irrigation work there are noted, under the head of design and invention of apparatus, work on an adjustable tube orifice meter, an integrating instrument, a vortex tube sand trap, a riffle deflector-vortex tube sand trap, a siphon type of sand trap, and farm lateral lining. Snow survey and irrigation forecasts and pumping for irrigation are also briefly discussed.

[Agricultural engineering investigations by the Iowa Station] (*Iowa Sta. Rpt. 1939, pt. 1, pp. 47–54*).—Farm-building losses due to wind and fire are reported upon by H. Giese, most of the study having been devoted to bent, glued, laminated rafter strength tests which showed the wood of rafters made with casein glue and 8 yr. in service to fail in horizontal shear before the glue failed; atmospheric exposure tests of wire and fencing (in which the thinnest of zinc coatings show no evidence of a failure of the protective coating); utilization of plywood, steel, and lumber in farm-building construction, and farm-fence construction, all by Giese; and efficiency and economy of pneumatic tires for transport wheels on agricultural equipment, by E. G. McKibben.

[Agricultural engineering investigations of the Maryland Station] (*Maryland Sta. Rpt. 1939, pp. 19–21*).—Work on grain storage on the farm and electric milk pasteurizers is noted.

The agricultural situation in San Fernando Valley, California, P. A. Ewing (*U. S. Dept. Agr., Bur. Agr. Engin., 1939, pp. [4]+128, figs. 15*).—This is a report of a survey by the Division of Irrigation of the Bureau of Agricultural Engineering of the conditions affecting agriculture in San Fernando Valley, Los Angeles County, as in the autumn of 1938, including the costs of crop production, with special reference to the cost of water necessary for irrigation.

Land drainage and reclamation, Q. C. Ayres and D. Scoates (*New York and London: McGraw-Hill Book Co., 1939, 2. ed., pp. XI+496, figs. 316*).—This is a revision of a work previously noted (E. S. R., 61, p. 275). The

introduction has been entirely rewritten, the chapter on land clearing has been shortened, that on erosion control has been expanded into three chapters, and minor additions of new material and illustrations have been made throughout the book, including a discussion of soil-conservation districts added to the chapter on drainage districts.

Farm mechanics, O. L. Snowden and H. O. West (*Mississippi Sta. Bul. 337* (*1939*), *pp. 48, figs. 42*).—The work for which directions are given covers leather, including oak bark, chrome alum, and common alum tanning, as well as leather farm equipment; painting and wood finishing, including preparation of various paints, varnishes, waxes, whitewash, and the care of brushes; electric wiring and the care of motors (the last-named work being restricted to oiling and cleaning); forge work, including tempering; soldering, including a home-made "furnace" by means of which one blowtorch is made to heat two or more coppers; home-made farm equipment and home conveniences; handy farm devices; and the farm workshop.

Use and abuse of wood in house construction, R. P. A. Johnson and E. M. Davis (*U. S. Dept. Agr., Misc. Pub. 358* (*1939*), *pp. 25, figs. 63*).—This publication is based upon a recent inspection by the Forest Products Laboratory of 600 houses under construction in 20 communities in Northern, Southern, and Eastern States and deals principally with those construction features shown to be most likely to be misunderstood or neglected. It concerns carpentry and the application of structural principles, as well as the quality of wood used therein, rather than finish or decoration; arrows, circles, and lettering added to the photographs being used to make the nature of the details respectively considered clear to those without technical knowledge of building methods. Special emphasis is placed on those constructional details which are necessary to provide adequate drainage from all wood members and to prevent penetration of water into spaces in wood construction from which it cannot readily escape; on sill and frame construction to avoid uneven shrinkage and unequal settling; and on effective protection where termites are to be expected.

Tractor repair and maintenance, R. I. Shawl (*Illinois Sta. Cir. 499* (*1939*), *pp. 58+[2], figs. 31*).—This circular describes the various parts of a tractor that need attention from time to time, tells what to look for in checking to see that the parts are in proper working order, and gives detailed directions for adjustment and repair. A complete check list showing what to do and when to do it is provided, as well as a short list of the operations which should be left to the expert motor mechanic. The qualities of tractor fuels, oils, and other supplies, and their suitability for use under different operating conditions are also discussed.

Mechanical harvesting of cotton as affected by varietal characteristics and other factors, H. P. Smith, D. T. Killough, D. L. Jones, and M. H. Byrom (*Texas Sta. Bul. 580* (*1939*), *pp. 49, figs. 17*).—A stripper-type harvester and an extractor, developed by the station, were mounted on a tractor and used to study varietal characteristics influencing machine efficiency and extracting qualities of different varieties. Cleaning qualities were tested with a cylinder cleaner.

Varietal characteristics affecting machine efficiency were found to be shape of plant, height of plant, length of branches, number of branches, density of foliage, type of boll, bolls borne singly or in clusters, storm resistance, degree of boll spread, fluffiness of the cotton, brittleness of branches and boll peduncles, and height of first branches above ground. The best plant type for both the mechanical stripper and the picker has relatively short but numerous fruiting branches with short nodes, no vegetative branches, an open-type growth, light foliage, storm resistance, and a large, strong boll on a single peduncle which will snap

easily under tension but will withstand considerable plant agitation. Plants at College Station averaging from 30 to 32 in. in height gave an average machine efficiency of 92.1 percent. At Lubbock plants averaging from 20 to 24 in. in height gave 98.2 percent average efficiency. Varieties producing numerous long branches gave lower efficiency than varieties with shorter branches. It was observed that cotton bolls hard to pull from the plant may cause higher percentages of loss with the stripper-type harvester, but bolls that snap off too easily were also found not to be desirable. The general average angle of spread of cotton bolls for all varieties tested was 120° at College Station and 115° at Lubbock. Plant characteristics appeared to affect machine efficiency more than either mechanical factors or cultural methods.

At College Station hand-picked averaged one-half grade better than hand-snapped and one and one-half grades better than machine-harvested cotton. At Lubbock, in 1937 machine-harvested cotton averaged one grade lower than hand-snapped, but in 1938 the average for the three methods of harvesting was strict middling.

Factors found to influence the efficiency of an extractor were rate of feeding and of flow of material through machine; speed of extractor saws; compactness; uniformity of distribution; agitation; amount of burs, unopened bolls, limbs, sticks, and leaves; size of boll; shape of boll; weight of bur; degree of boll spread; fluffiness; storm resistance; fiber drag; and length of staple. Cleaning was influenced by previous handling, quantity and kind of trash, type of cleaner, speed of cleaner parts, kind and condition of screen, rate of feeding, density of fiber on seed, fineness of fiber, length of fiber, and moisture content. Trash was more easily removed from coarse-bodied than from fine, silky cotton. The grade of mechanically harvested cotton was affected by the quantity and kind of trash; weather conditions; time of exposure; fiber injury by harvester, extractor, cleaner, and gin; and fiber characteristics such as fineness, density, and length.

The average acre yield of cotton harvested with the station harvester ranged from about one-half bale at College Station to approximately a bale in Lubbock. The authors find that the harvester will harvest low or high yields equally well if under comparable conditions of plant type and growth.

The improved fool-proof poultry house (*Missouri Poultry Sta. Bul. 40 (1939), pp. 33, pls. 2, figs. 18*).—This bulletin discusses size and shape, pointing out that the square floor plan provides a given floor space at the least cost for materials and with the least exposed wall surface; height, which is considered to be best made 8 ft. at the front and 6 ft. at the back, with plain shed roof; the foundation, which should be of concrete, deep enough to be rat- and frostproof, the recommended dimensions being 6-in. thickness and from 12- to 15-in. depth, with from 8 to 12 in. above ground outside at the low point; floors (for which plans are not included, though floor construction, especially of concrete, is fully discussed and illustrated by photographs), the dirt floor being considered unsatisfactory if either wood or concrete is possible, the wood floor very satisfactory though less durable than concrete, and the concrete floor best if properly made; construction of a concrete foundation and floor; walls, for which shiplap or drop siding are recommended, or ordinary box lumber if cracks are battened after settling and shrinking; shape and type of roof, the semimonitor and monitor types being condemned as expensive, difficult, and likely to give too much air space in most climates; windows and sunshine; ventilators, front and rear; doors; roosts; droppings platform and ceiling; arrangement of nests; trap nests; home-made trap nests; dry-mash hopper; feed bins; partitions; exits; arrangement of interior; etc. Side and end plans and elevations are included.

The straw-loft poultry house, H. H. Alp and W. A. Foster (*Illinois Sta. Cir. 501 [1939], folder, pl. 1, fig. 1*).—This circular is essentially similar to Circular 412 of the same station (E. S. R., 70, p. 264), of which it is a revision, covering, as before, the construction of a 20- by 20-ft. house and giving plans, bill of materials, etc.

AGRICULTURAL ECONOMICS

Report of the Chief of the Bureau of Agricultural Economics, 1939, H. R. Tolley (*U. S. Dept. Agr., Bur. Agr. Econ. Rpt., 1939, pp. 40*).—The reorganization of the Bureau is briefly described. The methods used and progress made in building up comprehensive land-use plans, policies, and programs through joint participation by the Department, the State land-grant colleges, and farmers, and in relating research to planning are discussed. Studies of the Bureau on land tenure, migration to and from rural areas, farm values, mortgage indebtedness, short-term credit, farm taxes and local government, crop insurance, flaxseed and the tariff, citrus fruit and cotton, price fixing, foreign trade, marketing, prices, freight rates, etc., are briefly summarized.

[Investigations in agricultural economics by the Georgia Station, 1938–39]. (Partly coop. U. S. D. A. et al.). (*Georgia Sta. Rpt. 1939, pp. 9–14*).—Results not previously noted include (1) some general findings as to number of farms and acreage in 18 counties included in distress transfers 1921–35, the amount and sources of farm mortgage loans 1917–35 in 15 counties, rates of interest charged by and average size of loans made by different loaning agencies, and the number of farms and acreages included in voluntary transfers in 18 counties 1921–35; and (2) table showing the staple length of American upland cotton ginned in 1938 in the State and in 48 communities organized for cotton improvement.

[Investigations in agricultural economics by the Iowa Station, 1938–39] (*Iowa Sta. Rpt. 1939, pt. 1, pp. 202–232, 238*).—Results of investigations not previously noted are reported as follows: (1) A statement, by R. Schickele, as to farm operators' equity in real estate, mobility of tenants, farm foreclosure, tax burden on farm lands, and the recommendation of the Governor's Farm Tenancy Committee; (2) some findings as to the most profitable combination of hogs and dairy cattle, the most profitable types of dairy herds, labor requirements for cows, hogs, and poultry, crop rotations and relation of size and cropped acreage to income, by J. A. Hopkins, L. G. Allbaugh, R. K. Buck, and C. Y. Cannon, on 61 farms in northeastern Iowa; (3) post-war developments in the marketing of butter and cheese, by W. H. Nicholls; (4) statements by G. Shepherd and W. W. Wilcox, of the probable effects of corn marketing quotas on the price of corn; (5) some conclusions, by Schickele, based on a study of agricultural readjustments in southern Iowa; (6) tables, by T. W. Schultz, showing by years 1928–36 the relative percentages as compared with 1927 of German imports, total and from the United States, of wheat, corn, fruits and nuts, cotton, and lard, and the percentage of total imports from the United States 1927–36; (7) a short discussion, by Schultz, of the prices and expenditures for goods and services entering into farm expenditures and the effect on farm income; (8) conclusions in the study, by I. W. Arthur, as to the effectiveness of public regulation of livestock marketing in Iowa; (9) general findings, by Wilcox, as to the effectiveness of the A. A. A. program in Iowa, and probable utilization of roughage on farms of the State; (10) tables, by Allbaugh, showing the relative proportions of grain and roughage feed units, production of various crops, the feed unit consumption of different classes of livestock, and the returns by years 1932–38 per $100 of feeds fed and pasture costs with

different types of livestock; (11) utilization of power on Iowa farms, by Hopkins, Allbaugh, J. B. Davidson, and A. B. Caine; (12) tables, by O. D. Oderkirk, showing the cost by items of marketing dressed poultry and eggs; (13) tables, by Allbaugh, summarizes by areas of the State the data from 1,049 farm records for 1938 and compares the averages for such items as capital managed, acreages, amount of man labor, acreages in corn and hay, livestock numbers, efficiency factors, receipts, expenses, management return, and net farm and cash income for different groups of cooperators with those of the Farm Security Administration clients in Union County; (14) some preliminary findings, by Schickele and R. Morgan, as to percentages of gross rent required for taxes and tax assessments on better and poor lands in Ringgold County, and (15) some conclusions, by G. W. Snedecor and Schultz, as to technics suitable for partial census based on a random sample of 773 Iowa farms (stratified by county) obtained in a survey to determine the averages and variation of acreage, yield, income and expense from Iowa farms, to ascertain the practical problems of sampling, and to test certain schedule designs.

[**Investigations in agricultural economics and farm management by the Maryland Station, 1938–39**]. (Coop. U. S. D. A.). (*Maryland Sta. Rpt. 1939, pp. 8–10*).—Some general findings of investigations not previously noted are included as follows: (1) Land use, average number of cows, production of milk per cow, farm receipts and expenses, and farm labor income on 180 dairy farms in the upper Eastern Shore area of the State; (2) items materially affecting production per colony of bees, based on a study of data as to management, production, and marketing practices from 182 beekeepers; and (3) labor income, sources of farm receipts, potato yields, costs of production and marketing, marketing outlets, etc., for 103 farms in Garrett County in 1937.

[**Investigations in agricultural economics and farm management by the Cornell Station, 1938–39**] (*[New York] Cornell Sta. Rpt. 1939, pp. 93–97, 101, 102*).—In addition to results of investigations previously noted, brief general findings are included as follows: (1) By L. Spencer and G. R. Bishop, as to per capita consumption of milk and cream and the distribution to different outlets and by different types of distributors, etc., in Buffalo, (2) by Spencer, C. J. Blanford, and A. J. Pollard, on the changes in prices and sales of milk, cream, and evaporated milk in New York City, (3) by Spencer, on relation of indexes of farm price of milk in New York and wholesale prices of basic commodities, (4) by M. P. Rasmussen and E. W. Cake on the principal factors affecting volume of sales and operating expenses of farmers' country fruit and vegetable auction markets and of sales by producers and purchases by buyers in such auctions (coop. U. S. D. A.); (5) by W. Powell and A. W. Peterson, on factors affecting the costs of cooperative farm fire insurance; and by E. L. Arnold et al. on a survey of farm storages for apples.

An economic study of land utilization in Yates County, New York, M. D. Woodin (*[New York] Cornell Sta. Bul. 727 (1940), pp. 52, pl. 1, figs. 25*).—This bulletin continues the series (E. S. R., 82, p. 118). The topography, climate, transportation facilities, etc., of the county are described. The agricultural history, relation of land use, soils, elevation, real estate values, school costs, farm fire insurance and fire protection, etc., to land classes are discussed. Programs for rural development through road improvement, rural electrification, extension of telephone lines, and reforestation are suggested.

Factors in the organization and operation of farms in an upland cotton area of Louisiana, R. J. Saville and S. B. Thornton (*Louisiana Sta. Bul. 309 (1939), pp. 34; abs. as Bul. 309–A (1939), pp. 8, fig. 1*).—This bulletin is based chiefly on a survey in Bienville Parish of about 400 white owners and tenants

in 1931 and about 50 white owners for the years 1933–35. "Data were collected that would make it possible (1) to evaluate the different systems of farming and their adaptation to farms of different sizes, (2) to measure the relationship between size of farm and operator's income and products for family consumption, (3) to determine the composition of receipts and expenses under different farm organizations, (4) to determine the physical requirements and accomplishments for different systems of farming and sizes of farms, and (5) to arrive at the influence which certain physical factors such as soil and rainfall have upon farm organization and rates of production." The systems of farming, land and investment required for different systems and for different sized farms, crop organization, livestock organization, and the effects of size, labor efficiency, crop index, and index of livestock production on income are analyzed and discussed. In the analysis the farming systems considered are cotton, cotton and truck crops, cotton and livestock, and cotton and dairy, with subdivisions on the basis of size of farm.

The average operator's labor earnings for family farms with outside earnings of $10 or more was $142 as compared with $68 for those where such earnings amounted to $10 or less. For the cropper farms the average earnings were $40 and —$116, respectively. The average operator's earnings in 1931 on family farms under the different farming systems were: Cotton $53, cotton and livestock $100, cotton and truck crops $53, cotton and dairy $245, and all (196) farms $85. On cropper farms the earnings were —$193, —$97, —$49, and $59, respectively, for the different systems, and —$90 for all farms (166).

In relation to the effect of the four factors on income, the authors state "in relative rank it appears that the index of livestock production carried a higher degree of association with high labor earnings, and with a high proportion of farms with plus earnings, than did any other factor. Size of farm was associated with the lowest average labor earnings and the largest percent of the farmers suffering losses. For the other two factors it appears that labor efficiency was superior in the association with earnings and proportion of farmers with plus incomes for the cotton and livestock and the cotton and dairy systems, while the index of crop production was definitely superior for the cotton and truck crop system, and only slightly so, if at all, for the cotton system."

A study of farming in the Sandy Creek soil conservation demonstration area, with special reference to erosion control, W. E. Hendrix (*Georgia Sta. Bul. 203 (1939), pp. 42, fig. 1*).—The demonstration area, which embraces approximately 104,000 acres in the Piedmont region, was established in 1934. This bulletin reports the results of a study on the farming in the area, with special reference to erosion control. It is based on surveys of the 1933 farming operations on 195 farms, and the operations in 1937 on 117 of the same farms and 40 additional farms. Data on soil type, slope, and erosion for 64 of the farms included in the 1937 survey, and other information obtained from the Soil Conservation Service, supplement the survey data of the station. The area is described. Erosion control, land uses, crop rotations, mechanical erosion control measures, and the influence of the farming system, farming equipment, income, tenancy, and indebtedness on erosion cotrol are discussed.

The most significant change in the acreage of clean-tilled crops since the initiation of the Soil Conservation Service program was the decrease in the cotton acreage, which resulted primarily from the crop adjustment program. As the decrease under the crop adjustment program was proportional to the acreage previously grown, it was no greater on steep than on gently rolling farms. From the erosion control standpoint, there has been an increase in the acreages of close-growing crops. The farms cooperating that were included

in both surveys showed 10.2 percent of the cropland in winter legumes, 17.8 percent in cowpeas alone, and 15.1 percent in cowpeas interplanted with corn in 1937 as compared with 0.1 percent, 9.8, and 0.8 percent, respectively, in 1933. The largest acreages of close-growing crops were on the least sloping farms and the smallest acreages on the steeper and badly eroded farms. There was a slight decrease in livestock production since 1933. Farm income in 1937 averaged only $51 per farm. The highest income farms were those having high crop yields and a high percentage of cropland in cotton. There was little relation between income and total size of farm, acres of cropland, volume of sales, or investment.

Corporate land, foreclosures, mortgage debt, and land values in Iowa, 1939, W. G. Murray (*Iowa Sta. Res. Bul. 266 (1939), pp. 305–338, figs. 13*).—The conditions as to corporate-owned land, farm mortgage foreclosures, farm mortgage debt, and sales and assessed values of farm land are described and discussed. Some of the findings were: From January 1, 1937, to January 1, 1939, the percentage of the farm area of the State owned by corporations increased from 11.2 to 11.9, the net increase in acreage being 233,000 acres. Of over 4,000,000 acres owned by corporations, over 2,700,000 acres were owned by insurance companies. It is estimated that 550 farm mortgage foreclosures occurred in the State in 1938 as compared with 1,375 in 1937. Most of the foreclosures were in the western and southern parts of the State where corporate ownership has increased chiefly because of the drought conditions. At the beginning of 1939 the farm debt of the State was $710,000,000, being only 50 percent as large as on January 1, 1928. Foreclosures and other forced sales account for the major part of the reduction. On January 1, 1939, approximately 40 percent of the farm land of the State was mortgaged for an average of $53 per acre. The average interest rate in 1938 on new farm mortgages was down to almost 4.5 percent, the lowest average in the histoy of the State. The sale prices per acre for 4,142 bona fide sales in 37 counties averaged $76.62 in 1936 and $79.91 in 1937, the most common price in both years being between $71 and $80. Comparison of the sale prices and assessed values in 1936 and 1937 in 37 counties showed that low priced land was assessed at a relatively high percentage of the sale price.

Relationship of productivity of farm units and their ability to pay rent, R. R. Rawlings, Jr., and O. R. Johnson (*Missouri Sta. Res. Bul. 308 (1939), pp. 43, figs. 9*).—This study is concerned primarily with the development of a technic and method for determining the adequacy of farming units from the standpoint of paying a net rent. The method is illustrated by determination of the net rent on 102 farms in the Big Creek Watershed in Harrison County, Mo., and Decatur and Ringgold Counties, Iowa, 103 farms in Callaway County, Mo., and 103 in Nodaway County, Mo. The method of determining the cost of family living in feed units is described. Tables and charts show (1) for each area the cost in feed units of family living, operating costs, landlord's necessary expense, interest on landlord's improvement capital, and operator's management charge, total production, and net rent on farms of different sizes, (2) similar data on the Big Creek Watershed are shown for farms grouped on the basis of feed units produced per acre, and (3) the acres required in each area to afford a net income with various levels of land quality (productivity index). Other tables and charts show for the Big Creek Watershed the relationships between productivity and costs of production with a constant acreage, a comparison of actual and computed rents of land of varying productivity, and feed units from 100 acres and acres required to provide a net rent in Harrison County 1910–30.

The minimum size of farm required to produce a net rent was approximately 177 acres in the Big Creek Watershed area, 172 acres in the Callaway area, and 106 acres in the Nodaway area.

"Productivity seemed to have no very pronounced effect on cost of production where the acreage was held constant. When productivity was doubled total costs increased only 12 percent. The expression of relationship of all costs to productivity seemed to be a linear relationship."

The acres required to afford a net rent in the Big Creek area increased steadily from 1910 to 1930 when the cost figures were combined with change of productivity. Soil depletion was evidently having an increased effect on the size of farm required to afford a net rent.

Land tenure in Arkansas.—I, The farm tenancy situation, J. A. Baker and J. G. McNeely. (Coop. U. S. D. A.). (*Arkansas Sta. Bul. 384 (1940), pp. 62, figs. 11*).—This is the first of a series of bulletins on land tenure in Arkansas. Data are included as to the extent and growth of farm tenancy in the United States and Arkansas. The general trends in farm tenancy in the State are discussed. The State is divided into four major tenancy areas, and the economic and social characteristics of farm tenancy in each area are described. Programs of some European countries and the United States for increasing landownership and improving landlord-tenant relationships are briefly described.

In 1935, 60 percent of the farms in the State were worked by tenants, of which 43.2 percent were sharecroppers and 56.8 renters. The percentages for white tenancy were 26.8 and 73.2, respectively, and for colored tenants 68.4 and 31.6. In the different areas from 53.1 to 62 percent of the tenants had occupied the farm on which they were living for less than 2 yr., and only from 15.7 to 23.3 percent had occupied the farm for 5 or more years. In 1930 only 12.4 percent of the tenants were related to their landlords. The size of farm in each tenancy area was smaller for sharecroppers than for renters and smaller for renters than full owners. The tenant farmers had lower incomes and participated less in social and recreational activities of their community than did farm owners.

Farm tenancy in Oklahoma, J. H. Southern. (Coop. U. S. D. A.). (*Oklahoma Sta. Bul. 239 (1939), pp. 38, figs. 37*).—This bulletin analyzes and discusses the growth and distribution and some of the economic and social characteristics of farm tenancy in Oklahoma. Tables, charts, and maps show the distribution, color, kinship to landlords, mobility, farm income, etc., of tenants. Types of leasing agreements, value of tenant farms, short-term credit of tenants, types of farming and land use by tenure, and the social status of tenants are also discussed.

In 1935, 61.2 percent of the farm operators of the State were tenants, the percentage having increased from 43.7 percent in 1900. Colored tenants made up 8.5 percent of the total as compared with 4.1 percent for full owner-operators. Tenants as a group were generally younger than owner-operators, but the age at which farmers became owners had risen from 27 yr. in 1908 to 37 yr. in 1937. The average value of owner-operated farms in 1935 was $3,915 and of tenant farms $2,809. The average value of machinery and equipment was nearly twice as great for owner-operated as for tenant farms. In the northwestern and western parts of the State a large proportion of the tenants were related to their landlords. Approximately one-third (50,000) of the tenants move each year. The cost of such moving is estimated at over $1,499,000. Tenant farmers operate more cash-crop farms than owners, and the indications are that tenant incomes are higher than those of owner-operators on the better agricultural lands and lower in the poor farming areas. Church membership, educational attainments, and social status of tenants were lower than those of owner-operators.

Finding good farm tenant is important, R. T. BURDICK (*Colo. Farm Bul. [Colorado Sta.] 2 (1940), No. 1, pp. 14, 15*).—An application form designed to obtain better landlord-tenant understanding is appended to this discussion.

Income parity for agriculture.—I, Farm income: Sect. 9, Income from oats and barley, calendar years 1910–38, J. L. ORR, R. F. HALE, C. M. PURVES, and R. E. JOHNSON (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Adjust. Admin., and Bur. Home Econ., 1939, pt. 1, sect. 9, pp. [2]+II+143, figs. 6*).—This report continues the series (E. S. R., 82, p. 403). It includes tables and charts showing for each crop by years for the United States and by States the sales, average price and cash income, and the quantity and value held for sale by farmers January 1.

Oklahoma farm price statistics, 1910–38, T. R. HEDGES and K. D. BLOOD (*Oklahoma Sta. Bul. 238 (1939), pp. 123, figs. 5*).—Tables show the monthly and annual prices and indexes of prices and purchasing power of 25 farm products 1910–38, inclusive. Six tables are also included showing indexes of prices received and paid by farmers and purchasing power of farm prices in the United States 1910–38, amounts and distribution among products of Oklahoma gross and cash farm incomes 1936–38, and the average distribution of monthly marketings of Oklahoma farm products 1924–28. The movements of Oklahoma prices, the relationship of Oklahoma and United States farm prices and of farm prices to prices for nonfarm products, and purchasing power of Oklahoma farm prices are discussed. The method of calculating the index numbers is described.

Prices and Pennsylvania agriculture, E. F. ANDERSON and F. P. WEAVER (*Pennsylvania Sta. Bul. 384 (1939), pp. [4]+78, figs. 13*).—This study continues the price studies previously noted (E. S. R., 73, p. 121). A brief history is included of the general price level and the factors affecting it. The price movements of Pennsylvania farm products (composite index of 21 products) and of commodity groups, cash income of Pennsylvania farmers, seasonal variations in marketings and prices, cycles and trends in prices of farm products, purchasing power of such products, farmers' costs, the variations in prices by districts, etc., are analyzed and discussed. The methods used in calculating the indexes for individual products, groups of commodities, and the composite index of the 21 commodities are described. Tables showing the monthly prices paid for individual products (1908–38) and the indexes of such prices are included in the appendix.

Crops and Markets, [December 1939] (*U. S. Dept. Agr., Crops and Markets, 16 (1939), No. 12, pp. 257–316, figs. 2*).—In addition to crop and market reports of the usual types, tables are included and discussed showing for 1938 acreage harvested, average yield per acre, gross cost per acre by items, and net cost per acre and per bushel or pound for corn, wheat, and oats by groups and States and cotton by States and regions.

Foreign Agriculture, [January 1940] (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Foreign Agr., 4 (1940), No. 1, pp. 62, figs. 12*).—Two articles are included: Argentine Pastures and the Cattle-Grazing Industry, by P. O. Nyhus (pp. 3–30); and French Wartime Control of Agriculture, by N. W. Hazen (pp. 31–62).

Tobacco production and consumption in the Japanese Empire, J. B. GIBBS (*U. S. Dept. Agr., Off. Foreign Relat., F. S. 80 (1940), pp. IV+54, figs. 14*).—The several sections of this report deal with the origin and early developments in the industry; the tobacco monopolies; tobacco production, including classes and types of tobacco grown, factors influencing the development of different types, cultural practices, harvesting and curing, etc.; grading and marketing; exports and imports; manufacture and consumption; and probable developments affecting American tobacco producers.

The world wheat situation, 1938–39: A review of the crop year, J. S. Davis (*Wheat Studies, Food Res. Inst.* [*Stanford Univ.*], *16* (*1939*), *No. 4, pp.* [*2*]+*113–204, figs. 23*).—Bumper crops, due to high yields on record world acreage, made wheat unprecedentedly abundant in 1938–39. Prices, where unsupported by public agencies, fell to very low levels. Governmental interventions were more nearly universal than in any year since 1919, and these kept returns to producers generally remunerative except in Canada and Australia. Wheat disappearance in the world ex-Russia was larger than ever before. World wheat carry-overs nevertheless increased by more than 500 million bushels to approach the 1934 peak.

Wheat and war, 1914–18 and now, M. K. Bennett (*Wheat Studies, Food Res. Inst.* [*Stanford Univ.*], *16* (*1939*), *No. 3, pp.* [*2*]+*67–112, figs. 14*).—During the World War, difficulties in maintaining wheat supplies in Europe culminated in acute shortage in 1917–18. Overseas countries secured only moderate crops in 1917 in spite of expanded acreage, and their total supplies were too small to yield exportable surpluses adequate to cover the heavy world import requirements of 1917–18. In addition, shortage of shipping prevented Southern Hemisphere surpluses from passing fully into export. At the outset of the present war, European countries were in a far better position than in 1914 to hold down their essential requirements for overseas wheat.

The peanut industry: A selected list of references on the economic aspects of the industry, 1920–1939, H. E. Hennefrund (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 80* (*1939*), *pp. VIII*+*238*).—This is an annotated list of 641 selected references to books, pamphlets, and periodical articles relating to the economic aspects of the peanut industry in the United States and in foreign countries from 1920 through the first five months of 1939. Included are references on the Agricultural Adjustment program for peanuts, cost of production and labor requirements, grading and standardization, legislation, markets and marketing, mechanization of the industry, statistics, storage of the crop, and utilization of the crop as feed, in peanut butter, and as an oil. A few references are included on oil extraction and nutritive value of the peanut. With a few exceptions, references on culture, diseases and pests, and analyses of commercial feeding stuffs are omitted.

Post-war concentration in the cheese industry, W. H. Nicholls. (Iowa Expt. Sta.). (*Jour. Polit. Econ., 47* (*1939*), *No. 6, pp. 823–845, figs. 3*).—This article is based on the investigation of the station on post-war developments in the cheese market, previously noted (E. S. R., 82, p. 122). The shift in cheese from an unstandardized bulk product to one in a form well-adapted to extensive product differentiation and advertising is traced. The causes of post-war concentration in the industry and evidence of oligopolistic behavior both in the sale of the processed product and in the purchase of bulk cheese are discussed. "The recent quantitative importance of the various cheese-marketing channels is estimated, and the forces bringing about a trend toward more direct marketing analyzed. The paper concludes with the consideration of a few broader questions of social policy suggested by the patent situation in the cheese industry."

Butterfat procurement by creameries in Butler County, Iowa, P. E. Quintus and F. Robotka (*Iowa Sta. Res. Bul. 265* (*1939*), *pp. 253–302, figs. 9*).—This study is based chiefly on the records for the period May 1–15, 1937, for 13 creameries that operated 78 truck routes and received approximately 77 percent of their butterfat by truck. The general aspects of the situation in the county are described. The methods of gathering butterfat, the organization, ownership and control of routes, the amount and basis of payments to haulers, method of collecting hauling charges, service rendered by truckers, net returns to haulers,

effect of the procurement methods on quality of cream, scale of operation of the creameries, the organization of trade areas, etc., are discussed. The situation in the county is appraised and suggestions made for improving it.

During 1937 there were 10 creameries operating in the county with an average of 236,000 lb. of butter per year. Thirteen creameries outside the county also received a portion of their butterfat from truck routes extending into the county. The percentage of sweet cream tended to be highest for direct deliveries and lowest for truck routes over 40 miles in length. Cream was hauled exclusively on 67 of the routes. About two-thirds of the routes ranged from 30 to 59 miles on a round trip basis. The major portion of the trucks traveled between 1 and 2 miles per patron and obtained 4 to 10 lb. of butterfat per mile traveled. All but 2 trucks were owned by the haulers, who were paid on a commission basis, the rates being 2, 2.5, 2.7, and 3 ct. per pound of butterfat. The 2 lowest rates were charged on over 80 percent of the butterfat. Six of 12 creameries deducted the full rate paid haulers from the patrons' cream checks and 6 paid 0.5 to 1.5 ct. of the charge from their general fund. There was excessive overlapping in the areas served by individual creameries. Patrons in a township studied were served by 9 creameries, there being as many as 5 reported in a single square mile. One creamery area served only 14 percent of the producers within an 8-mile radius. It is estimated that fewer and larger plants each serving the producers in a minimum area could reduce costs at least 2 ct. per pound of butterfat or about $50,000 per year.

Towards a perfect milk market, J. E. Donley (*Massachusetts Sta. Bul. 366 (1939), pp. 28, figs. 14*).—This is a study of the supply channels of the Worcester, Mass., milk market, based on the records of milk dealer audits for the calendar year 1935 of the Massachusetts Milk Control Board. Tables and charts are included and discussed showing the relation of the Worcester market to other markets; the variations in size of business of dealers; the division of the market by price plans; the average monthly purchases and sales of milk as class 1 milk in the Worcester, Springfield, and Boston markets, and in the Worcester market by flat plan, use plan, and rating plan dealers; the State of origin of purchased milk and cream; the shipments of milk to the Worcester market 1930, 1932, and 1935; the location of producers in 1935 by price plans; division of milk supply among producers by size groups; the seasonal indexes of purchases in the Worcester, Boston, and Springfield markets and in the Worcester market by price plans; hauling charges per 100 lb. and per ton mile according to price plans; location of producers according to hauling charges; monthly prices for class 1 and 2 milk and the butterfat differential; location of producers according to prices received; and prices received by zones and price plans.

The study shows that in the Worcester market "the producer sells his milk regularly throughout the year, the dealer has very little surplus to dispose of, and the consumer is assured of a regular supply of good milk throughout the year. It would seem, therefore, that the supply side of the Worcester market was indeed normal."

The Kalamazoo milk market, O. Ulrey (*Michigan Sta. Spec. Bul. 300 (1939), pp. 44, figs. 9*).—The Kalamazoo milk market was relatively stable as compared with most other milk markets in Michigan in 1937–38. This bulletin discusses the reasons for this relative stability, and describes the facilities, institutions, and marketing practices in sections dealing with distributive channels and competition, and production and utilization of milk in the area; inspection of quality of milk; the Kalmazoo Milk Producers Cooperative—its organization, control, management, financing, operations, functions, and accomplishments; distributors; distribution for welfare and for schools; the Federal marketing agreement and

license; and milk prices and price plans. The milk marketing problems in the area are briefly discussed.

Economic analysis of the Baltimore egg market, L. E. Cron, R. F. Burdette, and S. H. DeVault (*Maryland Sta. Bul. 430 (1939), pp. 117–163, figs. 17*).—The purpose of this study was to ascertain the sources of supply of eggs on the Baltimore market; the trends in the sale of eggs on a wholesale and commission basis, returns to producers, and the cost of marketing eggs from the producer to the consumer; and the basis of price quotations in Baltimore and the relationship between retail prices and quality.

Data were collected by questionnaires and personal interviews from wholesale egg dealers, railroad and cold storage companies, retail dealers, bakeries, hotels, restaurants and consumers, the Federal-State Market News Service, and records of the Trunkline Inspection Service. The data on retailing included records obtained in July and August 1937 from 251 independent grocery stores, 33 dealers in 8 public markets, and 2 chain stores operating 332 retail store units. In July and August 1938 a door-to-door canvass was made of 1,075 families in 14 districts of the city in order to ascertain the preference for eggs. In 1938 a survey was made of 3 of the largest hotels, a chain of drug stores, and 33 restaurants to determine the type of eggs used. The origin of eggs; receipts by boat, truck, rail, and parcel post; the channels of distribution; the wholesaling of eggs; the establishment of prices by farmers, hucksters, storekeepers, and wholesalers; cold storage holdings, including shell, frozen, and dried eggs; the grades, quality, prices, etc., in retail stores and retail public markets; the purchases by consumers, methods used by consumers in determining freshness, and the factors influencing them in purchasing eggs; the volume and kinds of eggs purchased by hotels, drug stores, and restaurants; and other phases are analyzed and discussed.

Marketing Louisiana sweet potatoes, R. A. Ballinger (*Louisiana Sta. Bul. 310 (1939), pp. 38, figs. 12*).—The trends in acreages, production, and carlot shipments and the distribution of shipments of sweetpotatoes from Louisiana and the United States, the volume and destination of shipments by truck from Louisiana, local marketing practices in Louisiana, farm prices of sweetpotatoes, the seasonal trends of such prices, the relation between farm and wholesale prices, transportation costs from Louisiana to various markets, and wholesale prices of sweetpotatoes from Louisiana and other States in various markets are analyzed and discussed.

A study of grade, quality, and price of canned tomatoes sold at retail in Indiana, F. C. Gaylord and K. I. Fawcett (*Indiana Sta. Bul. 438 (1939), pp. 24, figs. 2*).—During 1935–37, inclusive, 2,909 cans of 399 different brands of tomatoes were purchased in independent and chain stores in 125 cities, towns, and villages of the State. The samples were graded by an official grader using U. S. grades. With each sample, data were recorded as to the type of store, location in reference to income of the patrons, price and size of can, grade shown on can and reported by store clerk, State where tomatoes were grown, whether cans were labeled by canner, wholesaler, or retailer, etc. Some of the findings were as follows: Of the tomatoes of known origin 86 percent were packed in Indiana, and 50 percent of the tomatoes packed in Indiana graded Extra Standard as compared with 18 percent from other States. Of the cans purchased 53 percent were labeled by the canners, 37 percent by the wholesalers, and 10 percent by the retailers. Of the 2,909 cans, 3 percent graded Fancy, 46 percent Extra Standard, 47 percent Standard, and 4 percent Substandard. Only 367 cans carried the grade on the label, and of those labeled Fancy, only 25 percent met the grade. Of those labeled Extra Standard, 61 percent met the grade, while of those labeled Standard, 67 percent graded Standard

and 21 percent Extra Standard. Fifty-one percent of all the tomatoes purchased in independent stores and 42 percent purchased in chain stores graded Extra Standard or better. The price per can in independent stores averaged 9.8 ct. in sections of low income and 11.3 ct. in sections of high income. Sixty-two percent of the tomatoes purchased in the high-income sections graded Extra Standard or better as compared with 48 percent in the low-income sections. Over the 3-yr. period chain-store prices averaged 1 ct. less per can than independent-store prices.

Minnesota cold storage locker plants, A. A. Dowell, S. T. Warrington, R. J. Eggert, and L. J. Fenske (*Minnesota Sta. Bul. 345 (1940), pp. 39, figs. 6*).—The development of cold storage locker plants in the State is briefly described, and an analysis is made of investment; operating expenses; gross plant income; net income; locker and processing costs; meat handled, sold, cut, and ground; meat consumed by patrons; etc., of 18 plants. The plants are grouped as follows: Group 1, three plants housed in separate buildings, operated as separate or independent enterprises, and having chill, cutting, sharp-freeze, and locker rooms and employing butchers to process the meat; group 2, eight plants similar to group 1 except that they are housed in creamery buildings and operated jointly with the creamery enterprise; group 3, five plants similar to group 2 except that no butchers were employed; and group 4, two plants equipped with locker rooms only. The advantages and disadvantages of the locker system and the future prospects for locker plants are discussed and suggestions made as to type and size of plant and operation and management.

A guide for members of REA cooperatives (*U. S. Dept. Agr., Rural Electrif. Admin., 1939, pp. 48, figs. 33*).—This booklet consists mainly of questions likely to occur to the members or prospective members of Rural Electrification Administration cooperative groups, with answers to these questions. It contains an introductory message from the Secretary of Agriculture and concludes with the text of the Rural Electrification Act of 1936.

Organizing a cooperative cotton gin, O. T. Weaver and U. H. Prickett (*Farm Credit Admin.* [*U. S.*], *Coop. Res. and Serv. Div., Cir. C–109 (1939), pp.* [*3*]+*66, figs. 10*).—This is a revision of the report Principles and Procedure for Organizing Cooperative Cotton Gins, previously noted (E. S. R., 81, p. 860).

RURAL SOCIOLOGY

Design of sampling experiments in the social sciences, G. W. Snedecor. (Iowa Expt. Sta.). (*Jour. Farm Econ., 21 (1939), No. 4, pp. 846–855*).—The author discusses some of the problems of the different types or methods of sampling.

[Investigations in rural sociology by the Iowa Station] (*Iowa Sta. Rpt. 1939, pt. 1, pp. 235, 236*).—Data are reported on aid to aged parents by children, by R. E. Wakeley, and factors determining the effectiveness of rural organization in selected Iowa counties, by Wakeley, C. A. Anderson, and W. H. Stacy.

[Investigations in rural sociology by the Cornell Station] ([*New York*] *Cornell Sta. Rpt. 1939, pp. 176–178*).—Brief reports are presented on selective factors in rural-urban migration, by D. Sanderson and A. A. Gessner; and transmission of farming as an occupation and the composition of rural households, both by W. A. Anderson.

Theory of human conservation, N. L. Whetten. (Univ. Conn.). (*Rural Sociol., 4 (1939), No. 4, pp. 385–398*).—The first part of this paper deals with the relation of human to natural resources. "In view of the evidence presented, that what comes to be regarded as natural resources is pretty much deter-

mined by man's wants and by his ability to use his physical environment to satisfy them, human beings are recognized as society's most important resource. Hence the problem of human conservation becomes paramount.

"The second part deals with quantitative aspects of human conservation. Since latest population estimates indicate that there will be about the same number of people in the United States 50 yr. hence as we have now, we are hardly warranted in taking any drastic measures either for increasing or decreasing our present numbers. More urgent is the need for frequent data to measure population changes as they occur so that plans can be made accordingly.

"The third part is concerned with qualitative aspects of human conservation, involving both biological and environmental considerations. Possibilities are noted for conserving the quality of the population through manipulation of environmental factors so as to give possible hereditary qualities more adequate opportunities for development, especially in those areas from which a large proportion of our future population seems likely to be recruited."

Conference Board studies in enterprise and social progress (*New York: Natl. Indus. Conf. Bd., [1939], pp. XVI+327, [pls. 21, figs. 118]*).—The studies reported include parts dealing with natural resources; population and working force; wealth and debt; national income and its distribution; consumption and standards of living; taxation, public expenditure, and debt; prices, wages, and profits; organization of American enterprise; and comparative economic conditions in the United States and other countries.

A theory of social security, with special reference to the significance of Government programs for rural society, C. A. ANDERSON. (Iowa Expt. Sta.). (*Rural Sociol., 4 (1939), No. 4, pp. 399–413*).—An attempt to formulate a strictly sociological concept of security proposes four criteria oriented around the central idea that security is the functional adequacy of a system of relationships. These four are (1) the congruence of the institutional patterns, (2) the adequacy of culturally given personal roles to the institutional ends, (3) the availability of facilities to the individual for carrying out these roles, and (4) the conformity of the modes and rates of change in personal roles and institutional patterns to the need for preserving stability or continuity in the system. To facilitate the comparison of the concept with reality, a fifth is added which is entirely a derivation from the preceding four—(5) the accordance of group structures and interrelationships with the institutional pattern. This concept is then applied to an interpretation of the diverse consequencies of the programs of social security in the field of agriculture.

Action programs for the conservation of rural life and culture, L. NELSON. (Univ. Minn.). (*Rural Sociol., 4 (1939), No. 4, pp. 414–432*).—This paper is an appraisal of the significance of the maze of local and national programs which have a bearing on the question of what it is in American rural culture that we wish to preserve, including survival values and values inherent in familism and territorial localism. The author's hypothesis is that the primary group derivatives, such as democracy, self-reliance, individuality, etc., have historically derived from the primary group, and that weakening the primary group will tend to weaken these qualities. Conversely, action to strengthen the primary group will tend to conserve these qualities. "Confronted by the fact of social change, we find ourselves attempting to adjust to a moving point rather than to a fixed star. Since as human beings we cannot be oblivious to the future and are irrepressible planners, the sociologist, at least, should try to see to it that the primary group has a place in the plan for the 'World of Tomorrow.' "

The pattern of social activities in a high participation group, C. A. ANDERSON. (Iowa Expt. Sta.). (*Rural Sociol., 4 (1939), No. 4, pp. 463, 464*).—The

author concludes that within each type of activity there is a positive correlation among alternative measures of its intensity. That is, families or individuals attending many organizations attend many types and they attend more often. In less formal activities there is the same picture; those who have varied interests nevertheless indulge them more often. Families who have many joint pleasures at home are able to allot more time to them. There is a positive correlation between intensity of participation in any one type of activity and that in any other. Many formal affiliations do not inhibit interest in informal activities or limit either activities with fellow family members in the home or indulgence in hobbies. Leaders are more active in groups than nonleaders. Persons chosen for positions of community responsibility have demonstrated their interest in and ability to handle active group participation. Women participation decreased with age, except that leaders were more often older women. The most active men were older than 30 yr. Tenure status was not very important. The number of children had a very slight adverse effect on the women's activities. Economic efficiency of the families was definitely related, positively, to social activity. Those making the most money were the high participators.

Social relationships and institutions in seven new rural communities, C. P. LOOMIS (*U. S. Dept. Agr., Farm Security Admin. and Bur. Agr. Econ., Social Res. Rpt., 18 (1940), pp. [4]+82, figs. 13*).—The author discusses community integration and disintegration, informal social participation, and participation in social agencies in the seven resettlement communities previously studied (E. S. R., 80, p. 842).

Indications are that in any community those families who are least mobile and participate most in the programs of organized community agencies make the most stable type of settlers. Uncertainty as to management policies vitally important to settlers and their families may lead to the circulation of misinformation and to unfounded dissatisfaction. The more the local groups shoulder the responsibilities of administration, the less reason they have to find fault with the resettling agency. In resettling families it is deemed important that the officials endeavor to avert situations that might result in powerful in-groups capable of destroying community integration.

A larger percentage of the families borrowed and exchanged work on the project during the year of study than in the community of residence previous to resettlement. With minor exceptions, associating families for all groups tended to resemble one another in the extent of formal and informal social participation and in the level of living. Resettled families did not associate with kinfolks as frequently after resettlement as before. In the communities of residence previous to resettlement, greater percentages of associations were between kinfolks in the older southern communities, in the Dutch village of South Holland, Ill., in the Indian-Mexican village of Tortugas, N. Mex., and in the area surrounding Bosque Farms, N. Mex., than in the more recently established western communities. Families associating with families living on the projects lived closer together than was the case previous to resettlement. Distance played a very important part in associational patterns. Associating families more frequently had common membership in nonreligious organizations and cooperatives than was the case for all other groups, with one exception.

Although the attendance of the families at church meetings was less than that of the same families previous to resettlement, it was relatively high considering the lack of facilities during early project development. Attendance at nonchurch meetings was greater than it had been for the same families previous to resettlement. This is accounted for in part by the cooperative, educational, and other nonreligious groupings sponsored by the resettling agencies. Families

living on the five resettlement projects not located in the Great Plains traveled about the same distance to organization meetings at the time of study as they did previous to settlement. Individuals who were leaders in their communities previous to resettlement were more likely to become leaders on the resettlement projects than those who were not leaders in their old communities.

The pattern of marriage selection in prosperity and depression, C. A. ANDERSON. (Iowa State Col.). (*Southwest. Social Sci. Quart., 20 (1939), No. 2, pp. 125–139*).—The author concludes that marriages contracted during a period of economic depression are more similar for the attribute of age than those formed in prosperous times; that the depression had a sobering effect upon young persons, leading them to choose mates more wisely or with different criteria of selection. Perhaps limitations of diminished incomes affect the social contacts of youth, narrowing the diversity of ages more than in prosperous times.

The transmission of farming as an occupation, W. A. ANDERSON. (Cornell Univ.). (*Rural Sociol., 4 (1939), No. 4, pp. 433–448*).—This is a report of an analysis made of the transmission of farming as an occupation over three generations as compared with nonfarming occupations in upper-class New York families. The article supports generalizations that may be helpful in constructing a theory of rural social selection, indicating the decreasing transmission of occupations from fathers to sons in succeeding generations, the self-perpetuating character of farming as an occupation, the transference of occupations to the oldest sons most frequently, and the entrance of sons of farmers who do not follow farming as an occupation into all types of occupations.

A study of mobility and levels of living among Negro sharecropper and wage-laborer families of the Arkansas River Valleys, O. E. LEONARD and C. P. LOOMIS. (Coop. Ark. Expt. Sta.). (*U. S. Dept. Agr., Bur. Agr. Econ., Farm Population and Rural Life Activ., 13 (1939), No. 2, pp. 1–11*).—"In the areas surveyed the most disadvantaged families are those of the sharecroppers and wage laborers who know little of economic security. The findings of this study indicate that neither of the two groups carries any considerable pecuniary advantage over the other, and that the classification of a family may vary from year to year, according to current plans of the manager or the operator of the plantation."

An American exodus: A record of human erosion, D. LANGE and P. S. TAYLOR (*New York: Reynal & Hitchcock, [1939], pp. 158, [figs. 113]*).—This book includes photographs and text presenting the plight of migrants to the Pacific coast in recent years of the present depression. Chapters deal with the Old South, plantation under the machine, midcontinent, plains, Dust Bowl, and the last West.

Housing in rural America, F. M. SWISE (*Rural Sociol., 4 (1939), No. 4, pp. 449–457*).—Analysis of data of the Farm Housing Survey of 1934 offers a basis for estimating rural housing conditions in 8 geographical regions. A sample of 596,855 rural homes, 8.6 percent of all rural homes, showed 50 percent of these to be in need of repairs. One out of every 4 farmers declared himself willing to borrow about $464 for repairs if available at reasonable interest rates. The high percentages of houses lacking adequate facilities reveal the need for a long-term rural housing program. Millions of rural Americans tolerate unsanitary, inconvenient, outdoor toilets (91 percent), carry water from wells (70 percent), do without central heating (91 percent), and lack a kitchen sink (72 percent). Rural housing is a field where Government expenditure can stimulate employment in a wide range of depressed occupations and at the same time raise the farmers' standard of living.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Southern crops, P. W. CHAPMAN and R. H. THOMAS (*Atlanta Ga.: Turner E. Smith & Co., 1939, pp. VIII+558, [figs. 238]*).—This is a textbook for use in vocational agriculture classes. The authors use the job-analysis plan for determining content, but leave the matter of developing outlines for the different subjects to the individual teachers. The units included cover essentials of management, cotton, corn, sweetpotatoes, tobacco, peanuts, rice and sugarcane, small grains, hay and pasture crops, and short biographical sketches of leaders in southern agriculture. Each chapter is followed by suggestions for study, selected references, and suggested activities.

Successful farming in the South, P. W. CHAPMAN (*Atlanta, Ga.: Turner E. Smith & Co., [1939], pp. IX+348, [pl. 1, figs. 180]*).—This textbook is designed for use in the intermediate and upper grades of common schools of the Southern States. It deals with fundamentals of farming and farm life and the problems of southern agriculture in sections on southern agriculture, fundamentals of crop production, living at home, livestock enterprises, the cotton industry, marketing farm products, farm plant and equipment, rural community life, and agricultural occupations. Suggestions for study, including word study, subjects for classroom discussion, suggestions for further reading, and things to do follow each chapter.

Undergraduate and graduate preparation for home economics research, A. F. MORGAN. (Univ. Calif.). (*Jour. Home Econ., 31 (1939), No. 10, pp. 685–695*).—A paper read before the home economics section of the Association of Land-Grant Colleges and Universities at the 1939 convention, with comments by W. B. McNeal and L. Bane.

FOODS—HUMAN NUTRITION

[Food and nutrition studies by the Georgia Station] (*Georgia Sta. Rpt. 1939, pp. 67–69, 71*).—This progress report includes brief summaries of an extension of previous work (E. S. R., 80, p. 557) on available calcium in pasture plants and green vegetables, dark adaptation in school children, the ascorbic acid content of vegetables, with values for fresh and canned pimientos, and a comparison of 19 varieties of cowpeas as to canning quality.

[Studies in foods and nutrition by the Iowa Station] (*Iowa Sta. Rpt. 1939, pt. 1, pp. 66–68, 162, 163, 164–171, figs. 3*).—The work covered by these progress reports, representing in most cases an extension of investigations noted previously (E. S. R., 81, p. 140), includes field-cooking and canning trials on a number of varieties of edible soybeans, by C. P. Wilsie, P. M. Nelson, and B. Lowe (pp. 66–68); influence of experimental technic during the preliminary depletion period in vitamin A determinations on the response of the test animals to supplementary feeding, by P. M. Nelson and P. P. Swanson (pp. 162, 163, 164); tests of the effect of lard, storage lard, and heated lard on the destruction of vitamin A in foods, by V. E. Nelson, P. M. Nelson, and Lowe (pp. 164–167); studies on the nature of the dietary deficiency causing progressive retardation of growth in successive generations of rats, dietary factors in the production and cure of toxemic pregnancies induced by the feeding of pork diets, and the lactagogue factors in liver and beef muscle, all by Swanson and P. M. Nelson (pp. 167–169); certain phases of the cooperative project on the nutritional status of college women as related to their dietary habits, including blood studies and a balance study on calcium, nitrogen, and phosphorus in a single subject, by P. M. Nelson and M. A. Ohlson (pp. 169–171).

Meat food products (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt., 1939, pp. 40, 41*).—This report notes an extension of studies on the nutritive value of various

types of commercial fats and oils used in cooking (E. S. R., 80, p. 846) and summarizes data giving direct evidence that protein can be converted into fat in the animal body.

Seasonal variation in chemical composition of common haddock, G. C. CROOKS and W. S. RITCHIE. (Mass. Expt. Sta.). (*Food Res., 4 (1939), No. 2, pp. 159–172*).—Four series of haddock samples caught over a period of 1 yr. were analyzed by methods noted or described for the content of moisture, ash, ether extract, organic nitrogen, ammonia, copper, iron, manganese, and phosphorus in the muscle tissue. The four series of samples included fish frozen whole at sea by means of solid carbon dioxide as soon as caught, fish frozen whole by the Birdseye method as soon as landed, and commercial fillets frozen by both the Birdseye and sharp methods. The results, reported according to the date of catch as averages for each series, indicate no significant differences in the composition of the samples frozen by the different methods, although total ash was somewhat higher in the samples brined as fillets. Although the haddock was very low (usually less than 1 percent) in either extract at all times, a slight rise was noted during the late fall, followed by a sharp decline during December that continued until late summer. There was also evidence of seasonal variation in the copper, iron, and manganese content of the muscle tissue, these minerals being lowest after the spawning migration in February or early March.

Leafy part vegetables is choicest, O. SHEETS (*Miss. Farm Res. [Mississippi Sta.], 3 (1940), No. 1, pp. 1, 7, 8*).—Analytical values obtained for the moisture and iron content of the leaf blades and of the stems plus midribs of turnip and mustard greens, collards, pokeweed, and lambsquarters are tabulated. On the basis of dry weight the leaf blades contained from 1½ to 5 times as much iron as the stems and midribs, while the leaves with midribs left in contained from 1⅓ to 2 times as much iron as the stem (petiole). In further analyses of turnip greens grown in five different areas, the leaf blade was found higher in iron than the midrib plus petiole, and except for one sample the leaf blade contained as much or more calcium and from 20 to 50 percent more phosphorus than the stem plus the midrib. These results are interpreted as justifying the common practice of discarding the stems or stems and midribs in the preparation of leafy vegetables for cooking.

Introduction to experimental cookery, E. H. NASON (*New York and London: McGraw-Hill Book Co., 1939, pp. IX+317, figs. 15*).—Written for those who have a background of elementary chemistry and cookery, it is the aim of this book to develop an appreciation of the scientific method of investigation. The principles and methods of setting up experimental cookery problems are described, and certain illustrative problems are suggested. It is intended that additional experience in the general procedures of experimental work should come from experiments set up and demonstrated by the instructor and from problems selected, organized, executed, and reported by the students themselves. The text also presents a survey of recent literature, and gives a wide range of references bearing on the following fields of investigation: Acidity, flavor, scoring of foods, fundamental concepts of colloids, jellies, foams, emulsions, new concepts of proteins, eggs and egg cookery, flours, batters and doughs, crystallization, fruits and vegetables, and meat cookery. A chapter, Introduction to Statistical Measurements, by A. E. Ebersold, is included. Recipes, old and new, are discussed, and a number of tables are appended.

[Food preparation studies of the Colorado Station] (*Colorado Sta. Rpt. 1939, pp. 29–31*).—Progress reports are given of an extension by W. E. Pyke and G. Johnson of investigations dealing with the baking of flour mixtures at high altitudes (E. S. R., 82, p. 275) and the culinary properties of potatoes (E. S. R.,

80, p. 132). Work on the first of these projects has included the effect of altitude on the tenderness of butter-type cakes in relation to variations of ingredients, the effect of egg quality upon the properties of cakes, methods of developing a stable meringue for whole-egg sponge cake, and preliminary studies of variables influencing the rate and degree of set of starch gels. The potato studies dealt particularly with the effect of the calcium ion on sloughing and fracturing and the development of a method for measuring variations in sloughing during the cooking process.

Do your potatoes boil to pieces? Salts in water control sloughing, W. E. PYKE and G. JOHNSON (*Colo. Farm Bul. [Colorado Sta.], 2 (1940), No. 1, pp. 11, 12, fig. 1*).—The tendency of potatoes to slough on boiling is attributed to the dissolving of the pectin-cementing material of the tissues in the cooking water. The addition of calcium salts to the water has been found to check the sloughing through preventing the disintegration of the pectin and also to control fracturing, although higher concentrations of calcium are required to prevent fracturing than sloughing. Naturally hard water containing a rather high content of calcium salts will prevent sloughing if the water is not too highly seasoned with table salt.

Directions are given for preparing an artificially hard water in Colorado from native gypsum or alabaster. Where gypsum is not available the use of soluble calcium salts is suggested, with preference for calcium lactate and calcium sulfamate over calcium chloride on account of the tendency of calcium chloride to absorb moisture. A mixture of 1 part of a soluble calcium salt and 3 of table salt added to cooking water to the extent of about 1 percent by weight is said to give satisfactory control of sloughing and a desirable salinity.

The Englishman's food: A history of five centuries of English diet, J. C. DRUMMOND and A. WILBRAHAM (*London: Jonathan Cape, [1939], pp. 574, pls. 16*).—This book presents a picture of the changing character of the English diet during the past five centuries against a background of social and economic history. The relation of the diets to certain outstanding deficiency diseases, rickets and scurvy in particular, is discussed, and an interesting table is appended presenting an analysis in terms of protein, fat, calories, calcium, phosphorus, iron, and the several vitamins of some of the diets mentioned in the text.

On the state of the public health, A. S. MACNALTY (*[Gt. Brit.] Min. Health, Chief Med. Off. Ann. Rpt., 1938, pp. VI+230*).—In this report of the activities of the Medical Department of the Ministry of Health, a chapter is devoted to the relation of food to health and disease. For citation and discussion, the activities are grouped under the following headings: Nutrition, milk orders and designations, undulant fever (in relation to the consumption of raw milk), control of the purity of food, meat inspection, and bacterial food poisoning. In the first of these groups are cited the activities of the Advisory Committee on Nutrition; these include a family budget inquiry, a study of the distribution of the population of Great Britain into income groups, and dietary surveys.

Treatment by diet, C. J. BARBORKA (*Philadelphia and London: J. B. Lippincott Co., [1939], 4. ed., rev., pp. XV+691, [pls. 8]*).—The present edition of this book, noted previously (E. S. R., 74, p. 138), has been extensively revised and rewritten. The material on vitamins, vitamin requirements, clinical aspects of vitamins, and diagnosis of vitamin deficiency has been brought up to date. Chapters on the management of gall bladder disease, liver disease, peptic ulcer, nephritis, diabetes, gastritis, and allergy have been rewritten to present the newer conceptions in the relation of diet and adjunct treatment, and a new chapter has been incorporated on the dietetic treatment of hyperinsulinism. The chapter on Addison's disease includes new material on diet and food tables credited to Sister Mary Victor, St. Mary's Hospital, Rochester, Minn.

Nutrition and physical degeneration: A comparison of primitive and modern diets and their effects, W. A. Price (*New York and London: Paul B. Hoeber, [1939], pp. XVIII+431, figs. [140]*).—This book presents observations made by the author as to the facial and dental arch development and the extent of tooth decay in various isolated primitive groups that he investigated. The findings are interpreted in the light of observations made with regard to the life, customs, nutritional habits, and foods of these peoples, who are considered as controls in comparison with modern civilized groups. Conclusions concerning the primitive groups are considered as evidence in favor of the author's previous convictions, based on clinical laboratory research, that the present state of dental degeneration among civilized peoples is due to the absence of some essential factors from the modern dietary program rather than the presence of injurious factors.

Fat transport in the animal body, W. R. Bloor (*Physiol. Rev., 19 (1939), No. 4, pp. 557–577*).—This review article discusses the subject of fat transport under the following main headings: Transfer across the intestinal mucous membrane and fat absorption, the liver and fat transport, phosphorylation as a mechanism of fatty acid transport, transport across the placenta and egg membranes, cholesterol ester as a fatty acid carrier, and transport as neutral fat. Under the first of these headings consideration is given to fat splitting, soap formation, bile, absorption into the portal circulation, and to histological investigations of fat absorption. The bibliography includes 105 references.

Studies on the metabolism of calcium and phosphorus and on the availability of these elements from milk and from an inorganic source, K. M. Henry and S. K. Kon (*Biochem. Jour., 33 (1939), No. 2, pp. 173–191*).—The balance of calcium and of phosphorus derived either from milk or from $CaHPO_4 \cdot 2H_2O$ was studied in three separate metabolism experiments on young male rats. When the calcium and phosphorus were supplied in quantities well below the normal retentions, only about 30 percent of the calcium was retained, and some 90 percent of the excreted calcium was found in the urine. The retention of phosphorus, amounting to some 85 percent, was also not quantitative. When, through the addition of $Na_2HPO_4 \cdot 12H_2O$, the dietary phosphorus was increased to give an appreciable excess, the retention of the suboptimal quantities of calcium was markedly increased, the calcium from the spray-dried milk being retained with an efficiency of 98.1 percent, that from the inorganic source with an efficiency of 96.5 percent. The difference between these two figures was found significant. Under such optimal conditions the daily loss of calcium was 0.3 mg. per rat. Of this one-third was lost in the feces and two-thirds in the urine.

In the presence of extra calcium (as $CaCO_3$), the phosphorus being left unchanged, there was only a small effect on the retention of phosphorus. The minimum daily loss of phosphorus observed was 1.3 mg. per rat. Of this, 1.1 mg., or nearly 90 percent, was in the feces. It is suggested that this fecal phosphorus is mainly bacterial phosphorus, and that the relatively inefficient retention at suboptimal levels of intake is due to the fixation of some of this element by intestinal bacteria.

In all the comparisons the rats retained more calcium and more phosphorus from milk than from the $CaHPO_4 \cdot 2H_2O$, the difference being more pronounced for calcium. The poorer availability of the inorganic source was due to nonabsorption of some of the calcium phosphate, which passed unchanged through the gut. There was no evidence of active excretion of either calcium or phosphorus by the large intestine of the rat.

Effect of several calcium salts on the utilization of lactose, H. S. Mitchell, G. M. Cook, and K. L. O'Brien. (Mass. Expt. Sta.). (*Jour. Nutr., 18 (1939),*

No. 4, pp. 319–327, figs. 2).—Rats fed on an adequate ration containing 60 percent of lactose were given calcium supplements at 1.0- and 0.5-percent levels, respectively, the effect of six different calcium salts being studied in comparison with the effect of the unsupplemented lactose ration. Starch, dextrin, sucrose, glucose, and galactose rations, with added calcium salts, served as controls. With the calcium phosphate, carbonate, citrate, and levulinate supplements added to the lactose ration the rats showed as good growth, less diarrhea in general, the same degree of galactemia, and a similar incidence of cataract as rats on the unsupplemented ration. Calcium lactate was somewhat toxic at the higher level, but at the lower level it produced results comparable to those with the other calcium salts noted above. The calcium gluconate, however, resulted in poor survival, loss of weight or poor growth, diarrhea, and a low normal blood sugar. Lenticular changes were few or lacking. The calcium gluconate, when fed with starch, dextrin, sucrose, glucose, or galactose did not exhibit these inhibitory effects. Sodium gluconate exerted a deleterious effect similar to but more severe than calcium gluconate. "These criteria indicate that the gluconate radical may interfere with lactase activity in the intestinal tract. The phenomenon of 'competitive inhibition' in enzyme action is postulated as a possible explanation of these findings."

Studies in mineral metabolism with the aid of artificial radioactive isotopes.—II, Absorption, distribution, and excretion of potassium, M. JOSEPH, W. E. COHN, and D. M. GREENBERG. (Univ. Calif.). (*Jour. Biol. Chem., 128 (1939), No. 3, pp. 673–683, figs. 4*).—Artificial radioactive potassium, the preparation of which is described, was administered as the chloride to fasting rats in a study of the fate of this element in the animal organism. It was found to be largely absorbed from the gastrointestinal contents within ½ hr., the absorption occurring mainly from the small intestine and but little from the stomach. The uptake of potassium in the liver followed the absorption curve closely, the deposition in that organ being transitory and apparently incidental to its location in the path of the portal venous system. The permeability of skeletal muscle for potassium was low, the uptake being slow, with a continuous increase for 4 hr. (after which time the content of "labeled" potassium per gram of muscle was less than half the concentration in the blood), followed by a constant level for 22 hr. Excretion of the labeled potassium through the kidney took place at the moderate and nearly steady rate of about 6–7 percent per day, this being a measure of the rate of endogenous potassium metabolism of the body.

Vitamin content of certain Pacific fish oils, A. F. MORGAN, L. KIMMEL, and H. G. DAVISON. (Univ. Calif.). (*Food Res., 4 (1939), No. 2, pp. 145–158*).—In this study of the content of vitamins A and D in the offal, body, and liver oils, as obtained commercially or prepared in the laboratory, of important varieties of Pacific coast fish, the official U. S. P. XI biological methods were used for both vitamins A and D, and the Lovibond tintometer and the antimony trichloride reaction for colorimetric estimation of vitamin A. In the biological tests every assay involved feeding one or more animals from each litter a dose of reference cod-liver oil found by the tintometer to be approximately equal in blue value to the dose of the unknown oil fed at the same time to other members of the litter. The growth of litter mates on the unknown during the same time was taken as indicating the relative vitamin A content. The use of the antimony trichloride reaction for determining levels of oil to feed in the biological assay is considered economical and satisfactory.

In the colorimetric tests the U. S. P. reference oil was used as a check on the color production and constancy of readings, and the approximate number

of units per gram of oil in the unknown was estimated by direct proportion of blue unitage of the reference oil and the unknown oils to the known vitamin A content of the reference oil. It is considered that most of the difficulty in the method lies in obtaining dilutions which give the same depth of blue color within the proper range of tintometer readings. Suggestions are given for overcoming these difficulties.

A total of 65 oils was examined, including 16 extracted in the laboratory from livers and offal. Storage in the dark at −4° C. was found to cause no deterioration. Some of the commercial sardine oils of the 1934 catch were found to be much lower in vitamins A and D than the majority of spot and composite samples of one large run in the late season of 1938. Eight of the 11 samples of 1938 oil were at least equal to U. S. P. reference cod-liver oil in vitamin D content and contained more than 100 Lovibond blue units of vitamin A per gram. It is suggested that these relatively cheap sardine oils should be made available for children as well as for poultry. Other oils tested with their vitamin A and D values are as follows:

Seven commercial salmon offal oils contained 58–142 units of vitamin D per gram, and the vitamin A values of 4 of these oils approached the minimum standard for U. S. P. cod-liver oil. The liver oils from dog salmon and silver salmon had approximately the same content of vitamin D, about 500 units per gram, but the dog salmon oil had only about one-tenth as much vitamin A as the silver salmon, 5,800 and 57,600 units per gram, respectively. Totoaba (white sea bass) livers were rich in oil, containing 1,400–3,500 units of vitamin D and 46,000–180,000 units of vitamin A per gram, values within the range usually found in halibut-liver oils. Three laboratory-extracted tuna-liver oils contained from 35,000 to 54,000 units of vitamin D per gram and a somewhat larger content of vitamin A. Two lots of freshly extracted mackerel-liver oil contained 2,700 and 5,400 units of vitamin D and 16,000 and 211,000 units of vitamin A per gram. Two later samples contained 76,000 and 30 000 units of vitamin A per gram.

It is concluded that there is no predictable relation between the vitamin A and D contents of these fish oils nor between the oil content of the livers and the vitamin values of the oils.

The distribution of vitamins A and A_2, II, III (*Biochem. Jour., 33 (1939), No. 3, pp. 325–329, 330–337*).—These two papers continue earlier work (E. S. R., 79, p. 710). In the first, by J. A. Lovern, R. A. Morton, and J. Ireland, data are reported on the distribution of vitamins A and A_2 in the sturgeon, lampern, and dogfish and in various sea birds. "The work as a whole leads to the conclusion that vitamins A and A_2 probably do not replace one another with equal readiness in all functions. The enormous variations in the vitamin A content of fishes' intestines makes it probable that the mechanism of assimilation is different when vitamin A is a major intestinal constituent from that obtaining when the vitamin is a trace constituent."

In the investigation reported in the second paper, by J. A. Lovern and R. A. Morton, the distribution of vitamin A in the different coats of the intestinal tube of the halibut was studied by two methods—ultraviolet microphotography of sections cut transversely and determinations by the spectroscopic methods of the vitamin content of different layers of tissue after mechanical separation. The large vitamin A deposits in the intestines were found to be sharply localised in the mucosa, particularly in the tunica propria. A similar distribution was found in the fat. "The hypothesis is advanced that vitamin A esters, in combination with protein, may assist in the dispersion of these droplets and in the removal of fat from the tunica propria."

The conversion of carotene to vitamin A_2 by some fresh-water fishes, R. A. MORTON and R. H. CREED (*Biochem. Jour., 33 (1939), No. 3, pp. 318–324, fig. 1*).—It is shown through experiments on the fresh-water fish perch and dace that carotene acts as a provitamin for vitamin A_2 as well as A.

The prevention of carotene absorption by liquid petrolatum, A. C. CURTIS and R. S. BALLMER (*Jour. Amer. Med. Assoc., 113 (1939), No. 20, pp. 1785–1788, figs. 3*).—Emulsified liquid petrolatum preparations given in amounts of 20 cc. 3 times a day before meals, or twice a day before meals, or in 30-cc. portions before retiring were found comparable to plain liquid petrolatum in similar amounts with regard to their effect on absorption of food carotene from the gastrointestinal tract. Fasting blood sugar levels were used as an index of such absorption. It was found that plain liquid petrolatum saturated at room temperature with carotene (0.26 percent at 22° C.) still removed carotene from ingested food but in lesser amount; when saturated with carotene at body temperature (0.28 percent at 37°) the removal of carotene from the food in the gastrointestinal tract was prevented.

The B vitamins of California grape juices and wines, A. F. MORGAN, H. L. NOBLES, A. WIENS, G. L. MARSH, and A. J. WINKLER. (Univ. Calif.). (*Food Res., 4 (1939), No. 3, pp. 217–229, figs. 2*).—Included in the materials tested in this study were the juices of several varieties of grapes preserved by frozen storage or pasteurization and several commercial and experimental wines. These were tested for vitamin B_1 by rat growth methods, using the international clay adsorbate and later thiamin chloride as the standard of reference and for riboflavin, vitamin B_6, and filtrate factors by appropriate rat growth methods. The results obtained are summarized essentially as follows:

Grape juices preserved by either frozen storage or pasteurization lost their vitamin B_1 and riboflavin contents rapidly. All of the wines examined, including red and white, dry and fortified, contained approximately the same amount of vitamin B_1, 3 or 4 International Units per 100 cc., or from one-third to one-fourth the amount found in the freshly extracted juices. Aging did not appear to affect the vitamin B_1 and riboflavin content of the wines, but sulfiting the must before fermentation and clarifying with bentonite clay caused losses amounting to nearly 50 percent. White wines contained from 100 to 150 µg. and red wines from 27 to 80 µg. of riboflavin per 100 cc. A dry muscat wine contained 150 µg. per 100 cc. Muscat juice tested after 7 months' storage contained considerable vitamin B_6 but no appreciable amount of the filtrate factor.

Vitamin B_1 excretion on a varied intake, M. D. WRIGHT and A. Z. BAKER (*Jour. Hyg. [London], 39 (1939), No. 6, pp. 638–642*).—The urinary excretion of vitamin B_1 of a single healthy adult subject on a diet considered to be fully adequate was determined by the rat bradycardia method at intervals throughout an entire year. At first the subject took sodium acid phosphate twice daily to insure urinary acidity, but later this was omitted and the urine was acidified to a pH of about 5 in the collecting bottles by the addition of 2 drops of concentrated hydrochloric acid.

The vitamin B_1 content of the customary diet was estimated to range between 500 and 750 International Units, with the higher level more common. The urine values ranged between 43 and 180 I. U., with most of the values lying between 60 and 80. Following 1 week on a low vitamin B_1 diet, the excretion was reduced to about 13 I. U. daily. On the higher vitamin B_1 diets the ratio of vitamin to calories was 0.3 or over and on the low vitamin B_1 diet approximately 0.1. On the higher vitamin B_1 diets the excretion was from 10 to 12 percent and on the low vitamin B_1 diets from 4.5 to 8 percent of the intake.

Possible relation of calcium deficiency to the utilization of vitamin B_1.—Preliminary report, L. F. Badger and E. Masunaga (*Pub. Health Rpts.* [*U. S.*], *54* (*1939*), *No. 39, pp. 1775–1779*).—In studies on the relation of malnutrition to rat leprosy, rats on a vitamin B_1-deficient and on a calcium-deficient diet were found much more susceptible to the infection than normal controls. When given supplements of crystalline vitamin B_1, rats on either of the deficient diets became no more susceptible than normal rats, indicating that the increased susceptibility had been due to a deficiency of vitamin B_1. Calcium analyses of blood and of tail sections of rats in the several groups indicated that the B_1-deficient animals were similar to the normal controls in the utilization of dietary calcium. The animals on the calcium-low diet showed evidence of calcium deficiency, however, and administration of vitamin B_1 did not correct this condition, although it lessened the susceptibility of the animals to rat leprosy. Again, therefore, it seemed apparent that it was the deficiency in vitamin B_1 and not the calcium deficiency that had favored susceptibility to the rat leprosy. The blood of vitamin B_1-deficient rats showed an average vitamin B_1 content of 2.5 μg. per 100 cc., while that of calcium-deficient rats averaged 2.3 μg. These results are interpreted as indicating an inability of calcium-deficient rats to utilize the vitamin B_1 available in the diet. At higher intake levels of vitamin B_1 (as furnished by the supplement) this limiting effect of the low-calcium diet was not evident, as judged by the blood picture.

Induced vitamin B_1 deficiency in human subjects, R. D. Williams, H. L. Mason, and B. F. Smith (*Mayo Found. Med. Ed. and Res., Proc. Staff Mtgs. Mayo Clinic, 14* (*1939*), *No. 50, pp. 787–793, figs. 3*).—Four young women were kept for 21 weeks on a diet so constructed that its thiamin content was less than 0.1 mg. daily, the protein content (although low) above the minimal requirement, the carbohydrate never less than 188 gm. daily, and the ratio of thiamin to nonfat calories never higher than 0.085. Weekly, and later daily, analyses of the urine for thiamin were made by a thiochrome method. Other observations, made at intervals, included body weight, physical and neurological symptoms, electrocardiographic changes, dextrose tolerance, various blood tests, and basal metabolic rates.

During the first 7 weeks the output of thiamin was nearly equal to the intake. All subjects at first gained and then lost weight, but only one showed symptoms of anorexia. During the next 3 weeks anorexia increased, the food intake decreased considerably, and the thiamin output decreased to a still greater extent. Fatigue was noticeable, with decrease in activity. During the remaining 11 weeks the food intake was about the same as in the second period, but the thiamin output fell to very low levels, averaging 14γ daily. Anorexia, fatigue, achlorhydria, constipation, and inconstant tenderness of the muscles of the calves were noted in all cases. Slight impairment of tolerance for carbohydrate was noted in all subjects after about 13 weeks, and abnormalities in electrocardiograms developed.

One mg. of thiamin chloride was then administered to three of the subjects by subcutaneous injection every third day until 4 mg. had been taken. Daily determinations of thiamin in the urine showed an average of less than 0.6 mg. excreted. The subjects next received for 2 weeks a diet furnishing approximately 700γ of thiamin, and 3 days later were again given 1 mg. of thiamin chloride subcutaneously. The excretion at this time rose as high as 570γ and remained high during the next 2 days. It is sugested that depletion of bodily stores of thiamin can be detected by observing the excretion before and after the administration of 1 mg. of thiamin. Subjective improvement occurred in a few hours after the first administration of thiamin chloride.

improvement was also shown in the objective tests, and 2 mo. later there was no evidence of permanent damage as a result of prolonged periods on a deficiency of vitamin B_1.

Changes in the fur of rats due to deficiency of certain factors of the vitamin B complex, II [trans. title], G. LUNDE and H. KRINGSTAD (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 257 (1939), No. 5-6, pp. 201-216, figs. 10).—Rats on a basic B-free diet supplemented with 6γ of aneurin hydrochloride and 15γ of lactoflavin per rat per day developed severe dermatitis and came to constant weight at 70–80 gm. in about 6 weeks. At this stage various supplements were introduced in the ration, all of these proving effective in curing the dermatitis, although eliciting different responses in the matter of growth. Corn as a supplement caused resumption of rapid growth, as did a methyl alcohol extract (24-hr. Soxhlet extraction) of a concentrate from rice polishings. The residue from this extraction, fed at comparable levels, gave poor growth response, however. Apparently the growth factor had dissolved in the hot alcohol and remained stable to heat. Codfish and coalfish liver likewise permitted only poor growth. With all of these supplements, regardless of the growth response elicited, there occurred in time (3–9 weeks) more or less pronounced graying of the black fur and even darkening (reddish-brown) of the white fur. The condition improved spontaneously in certain cases, however, with continued feeding of the supplement. Brewers' yeast (½ gm. daily) given to rats showing poor growth and pronounced graying on the supplement of coalfish liver caused resumption of normal growth and a return of the hair color to normal. A hot-water extract of the yeast stimulated growth but failed to cure the gray condition. Inclusion of yeast in the basal diet from the beginning prevented the change in fur color. These experiments are interpreted to indicate that a new factor of the vitamin B complex is required by rats for normal development of the fur, a deficiency of the factor causing graying of the black hair. The new factor occurs in yeast which cures and prevents the graying tendency. The factor is less stable to heat than other known members (lactoflavin, nicotinic acid, and vitamin B_6) of the B complex and is apparently not identical with the so-called "filtrate factor" necessary for growth.

The distribution of riboflavin in meat and meat products, O. MICKELSEN, H. A. WAISMAN, and C. A. ELVEHJEM. (Wis. Expt. Sta. et al.). (*Jour. Nutr.*, 18 (1939), No. 5, pp. 517–526).—The microbiological method of Snell and Strong (E. S. R., 82, p. 58) was used in determining the riboflavin content of various meat tissues, including the same samples used in the previous study of the vitamin B_1 content of meat (E. S. R., 81, p. 741). Parallel tests by the bacteriological and rat-growth methods on a few samples gave practically the same values, and simultaneous assays of fresh and dried material at equivalent levels showed that no destruction of riboflavin took place during the drying process. Protein, fat, and moisture analyses of the additional samples and riboflavin values for all of the samples, calculated on the fresh and dry basis, are tabulated.

The highest content of riboflavin was found in liver and kidney tissues. The liver values ranged from 105 to 125 μg. per gram of dried material for beef, from 100 to 135 for veal, 90 for lamb, and from 80 to 90 μg. per gram for pork. Beef kidney contained from 90 to 100 and pork kidney from 90 to 92, pork heart 50 and beef heart 36, beef pancreas from 17 to 19, and beef liver 15 μg. of riboflavin per gram. Muscle tissues contained approximately 10 μg. per gram with the exception of light meat of poultry, two samples of which contained only 3 μg. per gram. The cooking method which appeared to have the least

destructive effect was stewing. Frying resulted in losses ranging from 33 to 50 percent and roasting from 30 to 60 percent.

On the assumption that the human requirement for riboflavin lies between 1 and 2 mg. per day, the conclusion is drawn that meats and meat products are an important source of this vitamin. It is estimated that from 50 to 60 gm. of fresh beef liver or 450 gm. of fresh pork loin would furnish the day's requirement when cooked by frying.

The vitamin C requirements of man, A. E. KELLIE and S. S. ZILVA (*Biochem. Jour., 33 (1939), No. 2, pp. 153–164*).—A number of experiments on the metabolism of vitamin C were carried out, two adult males serving as subjects. The level of excretion of ascorbic acid was determined for doses of 30, 50, and 100 mg., the determinations being made by employing each dose both by ascending from a condition of "unsaturation" and by descending from a condition of "saturation" produced by preliminary dosing with as much as 600 mg. per day. When equilibrium was attained on daily doses of 100 mg., urinary elimination amounted to 50–60 percent of the intake if the dosage followed a period of saturation; following a period of unsaturation, however, equilibrium was established with a urinary output representing about 30 percent of the intake. Similarly, with the other two dosages the level of urinary excretion of ascorbic acid was found to be lower after ascending from a condition of unsaturation (or from a condition of saturation reached on a lower dose) than when the same dosage was taken after having previously attained saturation with a higher dose. On a daily intake of 30 mg. the appearance of ascorbic acid in the urine almost ceased, and it is assumed that the minimum saturation dose lay close to this figure. In practice it is considered advisable to recommend the saturation dose as the minimum vitamin C intake, but it is pointed out that actually about half this dose has been found sufficient to prevent scurvy and maintain normal individuals in good health. "The ascorbic acid content of the blood was determined in two individuals during saturation and unsaturation at different intervals after the administraton of the vitamin in various doses. The comparison of these figures with those of the urinary excretion suggests that there is no constant renal threshold for ascorbic acid, but that there is a competition for the ascorbic acid of the blood by the absorptive capacity of the tissues and the excreting function of the kidney. Blood levels determined at random do not indicate the degree of saturation of a subject."

The determination of ascorbic acid in commercial milks, W. W. WOESSNER, C. A. ELVEHJEM, and H. A. SCHUETTE. (Wis. Expt. Sta.). (*Jour. Nutr., 18 (1939), No. 6, pp. 619–626*).—The procedure described by Mindlin and Butler (E. S. R., 80, p. 728) for the determination of ascorbic acid in blood plasma was modified slightly by replacing the potassium oxalate, cyanide, and metaphosphoric acid solution by the Willberg reagent of sodium chloride and oxalic acid modified to contain metaphosphoric acid. As a further aid to the production of a clear serum, the suggestion of Bessey (E. S. R., 82, p. 14) of repeating the photoelectric colorimeter reading after adding a crystal of ascorbic acid was followed. Determinations were also made of dehydroascorbic acid.

Freshly drawn milk was found to contain no dehydroascorbic acid. The milk from several groups of animals of different breeds, as tested on 3 consecutive days, showed variations in reduced ascorbic acid with the breed and with the milk production, but no daily variation in milk of individual cows. Average values reported by breed for the first day's testing were Holstein on winter feeding the year around 20.9 mg. ascorbic acid per liter, Holstein on summer pasture 21.7, Guernsey 22.2, Jersey 23.5, and Brown Swiss 25.3 mg. per liter. Commercial raw milks tested ranged in reduced ascorbic acid content from 7.1 mg. per liter for a sample of grade A Guernsey milk to 16.2 mg. per liter for

certified milk from a Guernsey dairy, with an average of 10.9 mg. per liter for 10 samples of different types. In the same samples dehydroascorbic acid was highest, 13 mg. per liter, in the sample with the lowest content of reduced ascorbic acid and averaged for the 10 samples 6.3 mg. per liter. Samples of commercial pasteurized milk ranged from 1.9 mg. for a grade A milk from one dairy to 14 mg. per liter for samples from three other dairies, with an average for the entire number of samples of 8.9 mg. per liter. Dehydroascorbic acid for the same 10 samples averaged 3.5 mg. per liter. Two samples of vitamin D milk produced by irradiation contained 8.7 and 4.1 mg. and 1 of a vitamin D milk produced by feeding irradiated yeast 6.9 mg. per liter. Samples of homogenized vitamin D milk and mineral-modified milk were very low in ascorbic acid, containing 1.7 and 2.7 mg. per liter, respectively.

The antirachitic value of human milk, J. C. Drummond, C. H. Gray, and N. E. G. Richardson (*Brit. Med. Jour., No. 4110 (1939), pp. 757-760*).—Twenty-six random samples of human milk, collected during the first 2 mo. of pregnancy from patients attending the infant welfare department of University College Hospital, were analyzed for vitamin D, calcium, and phosphorus. When the results of the vitamin D assay (conduced by feeding the separated fat to rats on a rachitogenic diet) were evaluated in terms of the international standard, the milks were found to vary in vitamin D content from 2 to 18 International Units per 100 cc., the average being 6 I. U. There was no evidence of seasonal variation, the mean value of 16 samples taken during the winter months being 5.9 I. U. per 100 cc. as compared with 6.2 for the 10 summer samples. Information on the diet of the mothers was not very satisfactory, but in general it appeared that the vitamin D content of human milk was not appreciably increased by raising the vitamin D content of the diet. Values of 3.7, 7.9, and 6.9 I. U. per 100 cc. were the averages associated, respectively, with milks of women receiving less than 100 I. U. of vitamin D daily, those receiving more than 100 I. U., and those who had received 1,000 I. U. in vitamin D therapy during the latter half of pregnancy. Values for total and dialyzable calcium ranged from 25 to 41 mg. percent and from 6 to 39 mg. percent, respectively; total phosphorus ranged from 10 to 18 mg. percent and dialyzable phosphorus from 3.6 to 11.0 mg. percent. These results, correlated with the scanty dietary information available, suggested that changes in the dietary intake of calcium or phosphorus are not reflected to any significant extent in the composition of the mother's milk.

Supplementary report on vitamin K, A. M. Snell and H. R. Butt (*Jour. Amer. Med. Assoc., 113 (1939), No. 23, pp. 2056-2059*).—The preliminary report (E. S. R., 81, p. 456) on the sources, nature, and clinical use of vitamin K is supplemented in the present article, which considers the various definitions of a vitamin K unit, the recent work on the chemical nature of the vitamin, the general clinical causes of deficiency in prothrombin, and methods of administering the vitamin.

A new low fluorine diet and its effect upon the rat, R. J. Evans and P. H. Phillips. (Wis. Expt. Sta.). (*Jour. Nutr., 18 (1939), No. 4, pp. 353-360*).—In experiments designed to study the effect of a low fluorine diet on the skeletal fluorine, growth, and reproduction of the rat, young rats were given a basal ration of mineralized milk and other groups the same ration plus supplements of 0.1, 1.0, 10, and 20 p. p. m. of fluorine as sodium fluoride. The rats were carried through several generations, some of the young always being analyzed at birth for fluorine content, others of the litter analyzed at weaning, and some of the adults analyzed after 4 and 7 mo. for the fluorine content of the tibia and femur.

The fresh milk of the basal ration, mineralized by the addition of 1 mg. of ferric iron and 0.1 mg. each of copper and manganese as the sulfates per 100 cc. of milk, proved to be a good low fluorine diet through five generations of rats. Fluorine at the level of 0.1–0.2 p. p. m. as found in the milk (furnishing 0.05–0.06 mg. per kilogram of body weight per day) appeared to meet the requirements of the rat for growth and reproduction and general well-being. It did not deplete the fluorine stores of the rat through five generations or increase the demand for fluorine. There was no cumulative fluorine effect carried over from generation to generation either on this low level or on the higher levels. Additional fluorine (0.1–20 p. p. m.) caused no appreciable improvement in the rat. At 10 p. p. m. bleaching of the teeth occurred, this effect and the increased growth of the incisors becoming more pronounced on a level of 20 p. p. m. At this higher level the bleaching was not prevented by the inclusion of 20 p. p. m. of aluminum as aluminum chloride or by the administration of an excess of vitamin A (3 drops of percomorph oil per rat per week). There was a placental transfer of fluorine even on the low level of fluorine ingestion. The transfer was not increased until the fluorine level reached 10 p. p. m., there being a definite increase thereafter in the fluorine passing through the placenta. Mammary secretion of fluorine was not affected, however, by as much as 20 p. p. m.

New knowledge of fluorine in relation to dental caries, G. J. Cox (*Jour. Amer. Water Works Assoc., 31 (1939), No. 11, pp. 1926–1930*).—This review article points up the studies on fluorine in relation to mottled enamel and dental caries. It is indicated that the threshold of tolerance for fluorine in the water supply is very low, concentrations variously estimated at from 0.9 to 2 p. p. m. being conducive to the appearance of mottled enamel; on the other hand, exceedingly low concentrations, possibly in the neighborhood of 1 p. p. m., may be beneficial in preventing dental caries. In considering the possibility of fluoridization of the water supply as a practical means of mass prevention of dental caries, the author warns of the hazards attending this treatment unless there is exact control, and mentions the various factors that would need to be given consideration in the selection and maintenance of a proper fluoride concentration.

An actinomyces-like organism associated with a food-poisoning outbreak, B. C. Chinn (*Food Res., 4 (1939), No. 3, pp. 239–244, figs. 12*).—An outbreak of food poisoning involving two people is reported, with data implicating canned fish roe contaminated with a pleomorphic actinomyceslike organism which so far as is known has never been incriminated in food poisoning. The characteristics of the organism are described in detail, with photomicrographs.

TEXTILES AND CLOTHING

[Studies in textiles and clothing by the Iowa Station] (*Iowa Sta. Rpt. 1939, pt. 1, pp. 173–175*).—This progress report (E. S. R., 81, p. 155) summarizes certain results obtained in studies by R. Edgar on protection from degradation which certain finishes provide wool and on the comparative degradation of cotton cellulose and regenerated cellulose rayon by five oxidizing bleaches.

Cotton shirts for men and boys, M. Smith (*U. S. Dept. Agr., Farmers' Bul. 1837 (1939), pp. II+14, figs. 17*).—This summarizes conveniently the qualities to look for in buying business and work shirts. Factors that make for differences in quality, namely, material, accuracy of cut, workmanship, and comfort of fit are considered in some detail.

Fabrics are discussed in general with regard to durability, ease of laundering, quality, finish, liability to shrinkage, and color permanence. Individual

fabrics such as broadcloth, Oxford, madras, chambray, end-to-end madras, percale, and covert are considered individually as to the identifying characteristics of the fabric and the purposes for which each is suited.

Design and workmanship in collars and fronts, sleeves and cuffs, cut of the back, buttons and buttonholes, and stitching and seaming are discussed with reference to good and poor features. Size measurements in relation to comfort of fit and the meaning of "full-cut" and "custom-made" are also considered. A brief section is devoted to boys' shirts and blouses.

HOME MANAGEMENT AND EQUIPMENT

Some family life patterns and their relation to personality development in children, L. H. Stott. (Nebr. Expt. Sta.). (*Jour. Expt. Ed., 8 (1939), No. 2, pp. 148–160, fig. 1*).—This report deals with the method of analysis of the responses of the 1,855 high school students in the family-life study noted previously (E. S. R., 82, p. 140) to the questionnaire used for the survey. The subjects were considered as three separate populations from farm, small town, and city homes, respectively, and the items in the questionnaire treated as follows:

"Tetrachoric intercorrelations among the items were obtained by the use of computing diagrams. The three correlation tables were then subjected to factor analysis by means of Thurstone's centroid method. In each case the number of zero factor loadings in the factor matrix was maximized by use of the graphical method of rotating pairs of axes in one plane at a time. An attempt was then made to interpret the rotated factors as 'patterns of family life' and as factors in the social environment of the home."

A comparison for the three populations of the characteristic family-life patterns as thus derived showed that, although there were differences in the total environmental or family-behavior patterns among the three general home settings, the same descriptive designations fitted all groups equally well. Two of the patterns, representing favorable and unfavorable factors, were selected for a study of their significance in relation to personal development of the children as measured by the mean scores on tests of three aspects of personality adjustment—(1) personal adjustment as measured by the Maller inventory, (2) independence of decision in personal matters, and (3) appreciation of home life. The differences between the contrasting groups were greatest in (3), followed by (1). The differences among the groups in aspect (2), although appreciable, were not statistically significant. The mean test scores of the favorable and unfavorable home environment groups from each population were also compared with the means for all of the subjects from the same population. All of the differences were in the expected direction and with one exception (independence in the members of the farm group) were quite reliable.

General home setting as a factor in the study of the only versus the non-only child, L. H. Stott. (Univ. Nebr.). (*Character and Personality, 8 (1939), No. 2, pp. 156–162*).—From the subjects in the family-life study noted above, 150 only children (40 from farm, 46 from small town, and 54 from city homes) were selected for comparison with non-only children from the same residence groups, of the same sex, with as nearly as possible the same Otis I. Q., and from families rated at the same economic and cultural levels. The personality scores in rationality of thinking, personal adjustment, honesty, independence in personal matters, resourcefulness in group situations, and personal responsibility were compared for the paired subjects in each of the three home settings.

The differences in scores for the paired groups from farm homes were generally very small, with only two items (rationality of thinking and independence in personal matters) approaching statistical significance, both favoring the non-only children. In the groups from small-town homes the differences were not significant, although three were greater than the standard errors. Slight differences in personal adjustment favored the non-only, and slight differences in honesty and ethical judgment the only children. In the city groups four differences appeared which might be considered fairly reliable statistically. In rationality of thinking the non-only children were superior and in personal adjustment, independence in personal matters, and personal resposibility the only children were superior.

In discussing these findings in comparison with the earlier theory that to be an only child is often somewhat of a misfortune, the author suggests that writers and investigators have failed to recognize the fact that onliness should not be regarded as a factor constant in its effects on all types of home setting and cultures and that its significance may change with general social changes. "Conclusions regarding the effects of having or not having brothers and sisters may legitimately be drawn only in terms of the particular environmental setting and the particular culture in which the study is made."

Farm family incomes and expenditures, M. G. REID (*Iowa Sta. Rpt. 1939, pt. 1, p. 233*).—This progress report includes a summary of classified expenditures of 160 farm families in Iowa.

[Studies in household equipment by the Iowa Station] (*Iowa Sta. Rpt. 1939, pt. 1, pp. 172, 173*).—Progress reports are given of studies by L. J. Peet of the performance of certain ice refrigerators when operated under controlled conditions, and by Peet and F. Madden of the efficiency and utility of six different electric roasters and ovens, and the operating efficiency of small electrical food mixers.

Liquefied gas for the household, A. H. SENNER and H. S. HOLBROOK (*U. S. Dept. Agr. Leaflet 191 (1939), pp. 8, figs. 3*).—This fuel consists of propane or butane or mixtures of these (obtained chiefly from natural gasoline), liquefied, and delivered in that state in heavy cylinders or tanks to the customers' premises and made available for use in the gaseous form. The distribution, type of cylinder installation, consumption measurement, the utilization for cooking, water heating, and refrigeration and safety factors are considered.

To determine operating characteristics and comparative costs of liquefied gas, electricity, kerosene, and gasoline, selected menus involving typical cooking processes were prepared on ranges using these various fuels. For economical results the liquefied gas must be used with specially designed equipment. In general the best baking and frying results were obtained on the gas and electric ranges and the poorest baking results were obtained in the kerosene and gasoline ovens, these lacking adequate thermostatic control. The time required for a given amount of cooking on the liquefied gas stoves was on an average about 88 percent of the time required on the electric stoves, 92 percent of that required on kerosene stoves, and 94 percent of that required on gasoline stoves. Fuel consumption used in the preparation of these meals indicated that 100 lb. of propane gas used for cooking would be the equivalent, respectively, of about 350 kw. hr. of electricity, 25 gal. of kerosene, and 27 gal. of gasoline. It is pointed out that many factors affect the comparative costs of these several fuels, but that in general liquefied gas and electricity are relatively high in cost as compared with gasoline and kerosene at average prices. The several fuels are also compared from the standpoint of convenience, cleanliness, and initial cost of equipment and installation.

MISCELLANEOUS

Report of the Chief of the Bureau of Plant Industry, 1939, E. C. Auchter (*U. S. Dept. Agr., Bur. Plant Indus. Rpt., 1939, pp. 53*).—The experimental work reported which has not been previously abstracted is for the most part noted elsewhere in this issue.

Fifty-second Annual Report, Colorado Experiment Station, [1939], E. P. Sandsten (*Colorado Sta. Rpt. 1939, pp. 64*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Fifty-first Annual Report [of Georgia Station, 1939], H. P. Stuckey (*Georgia Sta. Rpt. 1939, pp. 97, figs. 31*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Report on agricultural research [of Iowa Station] for the year ending June 30, 1939, I, R. E. Buchanan et al. (*Iowa Sta. Rpt. 1939, pt. 1, pp. 271, figs. 31*).—Part 1 of this report includes reports on all active projects except those relating to work coordinated under the Iowa Corn Research Institute. The experimental work not previously noted is for the most part referred to elsewhere in this issue.

The Fifty-second Annual Report of the University of Maryland Agricultural Experiment Station, [1939], J. E. Metzger (*Maryland Sta. Rpt. 1939, pp. 73, figs. 16*).—This report includes experimental work for the most part noted elsewhere in this issue.

Highlights of the work of the Mississippi Experiment Station: Fifty-second Annual Report for the fiscal year ending June 30, 1939, C. Dorman (*Mississippi Sta. Rpt. 1939, pp. 43*).—This is a reprint of articles previously noted (E. S. R., 82, pp. 308, 325, 331, 343, 348, 365, 369, 393, 417, 431).

Fifty-second Annual Report [of Cornell Station], 1939, C. E. Ladd et al. (*[New York] Cornell Sta. Rpt. 1939, pp. 92–194*).—The experimental work reported is for the most part noted elsewhere in this issue.

List of bulletins of the agricultural experiment stations for the calendar years 1937 and 1938, C. E. Pennington (*U. S. Dept. Agr., Misc. Pub. 362 (1940), pp. 91*).—This list, arranged by States and containing author and subject indexes, supplements that previously noted (E. S. R., 79, p. 143).

Publications available for free distribution (*Idaho Sta. Cir. 81 (1940), pp. [4]*).—A list of the station and extension publications available as of January 1940.

Farm Research, [January 1, 1940] (*Farm Res. [New York State Sta.], 6 (1940), No. 1, pp. 16, figs. 18*).—In addition to articles noted elsewhere in this issue, this number contains Testing Consumer Tastes [for a Cherry Juice Beverage Developed by the Station] (p. 4); Fish Farming a Major Business in Poland, by S. F. Snieszko (p. 8); and Tree and Shrub Seeds Receive More Attention, by C. E. Heit (p. 16).

NOTES

Tuskegee Institute.—According to a note in *Science*, Dr. George Washington Carver, director of agricultural research for many years, has given $33,000 to establish a foundation for chemical research. The foundation will be asked to preserve the Carver Museum, which contains an exhibit of the uses of native materials and houses about 100 paintings by Dr. Carver.

Arkansas University and Station.—Two barns for work animals and feed storage have been built at the main station farm to replace a stock and feed barn that burned last December. Both structures are two stories high, with loft storage for hay and gambrel roofs, and except for an asbestos-cement shingle roof and dressed pine lumber used in their construction are similar to barns being recommended by the college for low-cost construction. The total cost is approximately $4,000. A $2,500 brooder house for research in brooding and broiler production has also been completed.

A research project on the diagnosis and control of an actinobacillosislike disease of animals is to be carried on. The disease first appeared in the college herd about 1919 and was apparently due to the purchase of a bull with a "lumpy jaw." Subsequently many older cows developed a series of symptoms consisting of persistent diarrhea, loss of weight, and failure in lactation, and resulting in death. In most cases, post-mortem examinations have shown lesions similar to those produced in actinobacillosis, degenerative changes in the liver and kidneys, and in some cases the presence of pneumonia. A similar disease has also been found in calves and probably swine.

Another research project aims to develop adequate and practical methods for evaluating the breeding worth of beef sires and dams. Such methods are needed since the breeder who wishes to improve his herd now has difficulty in locating superior animals and adopting breeding plans for rapid improvement because of the lack of a system for measuring variation and of suitable methods for evaluating individual animals. The herd of purebred Hereford cattle at the main station farm will be used as the major breed and foundation for developing technic and preliminary steps in the formation of methods for measuring performance, and small herds of Aberdeen-Angus and Shorthorn breeds at the same location will be used to determine differences between breeds. To determine the practicability of adopted methods of measuring performance under large-scale operations, a herd of purebred Herefords to be maintained at the Livestock and Forestry Substation, near Batesville, will be utilized.

A project on the effect of environment on the growth of vegetables will be begun with research on potatoes, tomatoes, beans, cantaloups, and cucumbers and will eventually include all important vegetable crops in the State. This study will be conducted at the main station, the substations near Hope, Marianna, Stuttgart, and Batesville, and on special plantings that will supply any necessary conditions not elsewhere available.

Work is also under way on breeding and selecting watermelons at Bodcaw and a fertilizer demonstration near Forrest City. The project on watermelons will have as its object the securing of an early-maturing, wilt-resistant variety

or strain that is capable of producing high yields and table quality and is adapted to the marketing methods used in Arkansas. The fertilizer demonstration will supplement a study of the nutrition of peach trees and the factors that influence crop production by supplying data on the effect of different kinds and amounts of fertilizers on plant growth, yield, and quality of fruit.

Dr. Violet M. Wilder, instructor in biochemistry, resigned effective March 31. Recent appointments include John L. Bowers as instructor and assistant in horticulture primarily for the research on vegetables, John W. White as instructor in rural economics and sociology, and Otis T. Osgood as assistant in marketing research.

Illinois University and Station.—Dr. Sybil Woodruff, professor and chief in foods, has accepted an appointment as head of the home economics department of the University of Iowa, effective September 1, 1940.

Minnesota University and Station.—A special industrial development committee of the university has recently been set up with Dr. C. H. Bailey, vice director of the station, as chairman. This committee is offering to assemble literature and experimental reports from leading laboratories and research institutes all over the world for citizens and industries of Minnesota. Special emphasis will be placed on finding information about new products, manufacturing processes, or uses for raw materials when requests are received from industries confronted by problems in these fields. A charge will be made for actual labor costs involved. The library and information service is one section of the research institute recently established to make available the personnel, laboratories, and research facilities of the university for joint experiments with private individuals, cooperatives, industries, or manufacturers of the State.

J. O. Christianson, superintendent of the School of Agriculture, has been appointed director of short courses of the university department of agriculture. These courses number approximately 14 each year, ranging from a few days to 8 weeks in length and covering the fields of agriculture, forestry, and home economics.

Montana Station.—Kathryn L. Spain, laboratory technician in the veterinary research laboratory, resigned April 1.

Nevada University and Station.—A study on the utilization of native vegetation by range livestock and its relation to carrying capacity was started April 4. This project is being carried on under a cooperative agreement between the station and the U. S. Department of the Interior. The main objective is to determine from actual livestock operations the forage-acre requirement necessary for the various classes of livestock using the public range during the seasons of range use. A considerable amount of work was done on three areas in Elko County during the past year to determine the variation in volume of food produced by various plant species in relation to density. All findings thus far indicate a need for considering volume as well as density in estimation values.

Dr. Ernest A. Howes, professor of field husbandry from 1912 to 1913, but subsequently principal of the School of Agriculture at Vermillion, Alta., from 1912 to 1915 and since 1915 dean of the College of Agriculture of the University of Alberta, died February 10 at the age of 67 years. A native of Ontario, he was graduated from the Ontario Agricultural College in 1911 and received the D. Sc. degree from Laval University in 1928. He was president of the Canadian Society of Technical Agriculturists in 1925.

Cornell University and Station.—According to a note in *Science*, Dr. James E. Knott, professor of vegetable crops, has been appointed head of the division

of truck crops of the College of Agriculture of the University of California, beginning July 1.

North Carolina College and Station.—An allotment from W. P. A. funds of $6,457 has been arranged for improvement of facilities at the Piedmont Substation.

Dr. Robert F. Poole, professor of plant pathology and plant pathologist, has been appointed president of Clemson College.

Clemson College and South Carolina Station.—Last January the college assumed responsibility for what has been known as the Clemson College land utilization project, receiving a lease from the Federal Government for 50 years with an option for renewal for three additional periods of 15 years each. The college has turned the management over to the station.

The project area consists of about 27,000 acres of badly eroded soil near the college. It extends over an area of about 16 miles in a north-south direction and varies in width from 1 to 6 or 7 miles. The larger portion is in forest or has recently been planted to trees, and it is expected that the production of timber will be the chief use made of the area in the future. About 2,000 acres have been fenced and are available for pasture. An artificial lake has been constructed by the building of a dam at a cost of $300,000 or $400,000. The agreement with the Federal Government states that the area will be used as "a demonstration conservation area embodying the principles and objectives of planned multiple land use." In pursuance of these objectives special attention will be devoted to its forestry, grazing, and wildlife resources.

Recreational facilities which have already been provided by the Federal Government will be maintained and perhaps expanded. Formerly about 310 families resided on the project, and while at present more than two-thirds of these have moved away almost 100 families, consisting of about 500 individuals, are still in residence. This creates one of the chief problems in the management of the area. Another complication is the fact that while the Federal agencies which have heretofore managed the project have had rather large sums available for development and maintenance, the station will have only a very small appropriation for this purpose.

The resignations are noted of J. N. Todd as assistant entomologist to accept a position with the U. S. D. A. Bureau of Entomology and Plant Quarantine with an assignment in Florida; Dr. F. S. Andrews as associate professor of horticulture and associate horticulturist to take a position with the Florida Station at Belle Glade; and J. B. Richardson as instructor and assistant in agricultural engineering to engage in extension work in North Carolina. Recent appointments include M. J. Peterson as associate agricultural economist, J. M. Stepp as specialist in rural industries, and W. N. McAdams, E. R. Stewart, and Dr. W. M. Upholt as assistants in agricultural engineering, dairying, and entomology, respectively.

South Dakota College and Station.—R. J. Penn, associate professor of agricultural economics and associate economist, has resigned.

Texas Station.—Following an appropriation by the State legislature, the wool scouring and grading plant has been enlarged and relocated in the textile building, which provides space for a conditioning room and better facilities.

R. E. Karper, vice director and agronomist in charge of grain sorghum investigations, was on February 1 transferred to the Lubbock Substation in the grain sorghum region, where he will devote full time to developing new and superior strains of sorghum. Dr. P. C. Mangelsdorf, formerly assistant director, has been appointed vice director and agronomist in charge of corn and small grain investigations. Karl F. Manke has been appointed associate agronomist, primarily for work on the adaptation and improvement of legumes.

Washington Station.—Dr. Chauncey E. Sawyer, veterinarian at the Western Washington Station since 1925, died April 26 at the age of 49 years. A native of Kansas, he received the D. V. M. degree from the Kansas College in 1921 and served there during the following 4 years as instructor and assistant professor of animal pathology.

Necrology.—Hon. Asbury Francis Lever, of Columbia, S. C., widely known for his services to agriculture as a Member of Congress and with various farm loan agencies, died April 28 at the age of 65 years. As a member and chairman of the House Committee on Agriculture from 1902 to 1919 he sponsored in the House of Representatives an unusual number of important agricultural measures, among which were the Smith-Lever Extension Act of 1914, the U. S. Cotton Futures Act, the U. S. Warehouse Act, the Federal Food Production Act and the Federal Food Control Act of 1917, and the series of acts making annual appropriations for the support of the U. S. Department of Agriculture, thereby having a large influence upon its policy for many years. A recent tribute by his successor in the House, Hon. H. P. Fulmer, states that "Mr. Lever's principal objective in life, and to which he devoted practically all of his life's work, was to bring about a richer rural life for the Nation." Toward this goal he made a very substantial contribution.

Dr. Rodney H. True, in charge of physiological investigations of the U. S. D. A. Bureau of Plant Industry from 1902 to 1922 and subsequently associated with the University of Pennsylvania and the Morris Arboretum, died April 8 at the age of 73 years. A native of Wisconsin, he had received from the University of Wisconsin the B. S. degree in 1890 and the M. S. degree in 1892 and had served there as instructor and assistant professor of pharmacology from 1896 to 1900. He was granted the Ph. D. degree by Leipzig University in 1895 and was lecturer in botany in Harvard University in 1901-2. He was vice president of Section G, Botany, of the American Association for the Advancement of Science in 1920 and subsequently a councilor of the Association, and in 1919 was president of the Agricultural History Society and of the newly organized scientific and technical section of the D. C. Federal Employees Union No. 2.

Dr. Oran L. Raber, plant physiologist and conservationist in the U. S. D. A. Forest Service since 1935, died in New Orleans February 29 at the age of 47 years. A native of Indiana and a graduate of the University of Indiana in 1912, he received from Harvard University the A. M. degree in 1915 and the Ph. D. degree in 1920. He had served on the faculties of the Universities of Wisconsin, Michigan, and Arizona and in other institutions and was closely identified with *Biological Abstracts* from 1927 to 1929 and 1931 to 1933. He was notably well-equipped as a linguist, his most recent contribution being a German-English Dictionary for Foresters noted on page 776.

Dr. Adrian J. Pieters, associated with the botanical and agronomic work of the U. S. D. A. Bureau of Plant Industry from 1895 to 1910 and from 1915 to 1937 and then with the Soil Conservation Service until his retirement in 1938, died April 25 at the age of 73 years. He was in charge of forage crop investigations from 1926 to 1935, since which time he had given special attention to investigations of lespedeza and other acid-tolerant legumes.

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NOTE.—The abbreviations "Ala.", "Conn.[New Haven]", "Mass.", etc., after entries refer to the publications of the respective State experiment stations; "Hawaii" and "P.R." to those of the experiment stations in Hawaii and Puerto Rico; "Can." to those of the experiment stations in Canada; and "U.S.D.A." to those of this Department.

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